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In 1999, the Agency issued \$1,588,143,865.05 in Series 1999 Bonds. The Bonds were issued to (i) advance refund a substantial portion of the Series 1995 Fixed Rate Bonds and refund all of the Series 1995 Variable Rate Bonds, (ii) fund capitalized interest on the Series 1999 Bonds and fund a toll stabilization fund for the Series 1999 Bonds, and (iii) fund a use and occupancy fund for the Series 1999 Bonds. Based on the revenue projections by Wilbur Smith Associates (now CDM Smith), debt service on the Agency's debt was structured to grow at an average rate of 4.4% per year.

According to the Agency's disclosure document, over the past ten years, annual traffic transactions on the Foothill/Eastern System increased by an average of 0.03% per year, and annual revenues have increased by an average of approximately 3% per year during the same ten-year period. This is below the rate needed to keep up with escalating debt service.

In FY 2007-08, average weekday transactions decreased 5%, falling below 202,000 per day with annual revenues down 3% to \$102.8 million. Decreases in toll transactions and revenues continued to worsen the following year, dropping an additional 8% to \$94.1 million in FY 2008-09, with average weekday transactions of approximately 185,000 per day. Toll transactions continued to fall in 2009-10 to approximately 173,000 per day due at least in part to a toll increase in July that averaged 12%. However, 2009-10 revenues increased 6% to \$99.7 million. Toll transactions in FY 2010-11 and FY 2011-12 were flat with almost no growth; however, given the implementation of a system-wide toll increase in July 2011 of 7% on average, revenues increased 7% from FY 2010-11 to FY 2011-12. The Agency has approved a further toll increase of 4.8% for FY 2013-14, and has projected for budgeting purposes that annual gross revenues will increase by an equivalent amount, reflecting no growth in toll traffic.

The slower than anticipated revenue growth compared to the growth in debt service of 4.4% annually has made it necessary for the Agency to consider restructuring its debt in order to meet its bond covenants and payment obligations. In the past, the Agency's previous T&R [traffic and revenue] studies by Wilbur Smith Associates have significantly over-estimated revenues, leading to an over issuance of debt.

By its own admission, Caltrans acknowledges that existing traffic models are incapable of predicting changing HOV occupancy requirements and the numerous possible mode changes that may be associated with the proposed project. An example of potential errors in modeling assumptions can be found in the December 2012 STS. As indicated therein: "A direct comparison of the forecast and existing condition speeds must be made with caution, because the forecast speeds are based on modeling and existing speeds are based on field observation. It is not likely that speeds will increase with growth in traffic. The largest increases in speed from the existing condition to the No Build Alternative occur on the segment north of the exit to I-605 northbound and could be partially attributable to the forecast speed model not accounting for any back up and reduced speeds due to downstream congestion" (December 2012 STS, p. 3-4). Although the projections remain the same, that "caution" and the analysis of predicted bottleneck conditions north of the I-405/I-605 junction were removed from the June 2013 STS.

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Based on the assumptions made, variables selected, and the limitations of the modeling, how might actual 2020 and 2040 traffic conditions vary from those projected in the DEIR/S and SDEIR/S? From an environmental worst-case perspective, what are the possible consequences of the potential unrealized projections and failed performance expectations presented in the CEQA/NEPA documentation? What is to ensure that revenue projections under Alternative 3 do not suffer the same fate as those of the Foothill/Eastern Transportation Corridor Agency?

7.11 Committed Funding

As indicated in the SDEIR/S: "It should be noted that the State of California would implement a project only when enough funds have been collectively received for that specific mitigation measure. (A) If PA [preferred alternative] is Alternative 1 . . . (B) if PA is Alternative 2 . . . (C) if PA is Alternative 3" (emphasis added) (pp. S-5 thru S-7, 3-90 thru 3-91, and 4-30 thru 4-31). Since the OCTA's Board of Directors has already selected Alternative 1 as the LPA, it is both disingenuous to suggest that a different PA might now exist (e.g., "After the public circulation period for the Draft EIR/EIS, all comments will be considered, and the Project Development Team will select a preferred alternative and make the final determination of the project's effect on the environment." DEIR/S, p. 2-27).

With regards to funding, the above excerpt appears to lump together the terms "project" and "mitigation measures," such that the excerpt could be equally interpreted to read "the State of California would implement a project only when enough funds have been collectively received for that specific 'project'" (i.e., substituting the term "project" for "mitigation measure"). Since "mitigation" is only a line-item cost, the State's purported policy declaration would appear to relate to both any individual line-items and, more generally, to the total cost of a proposed action.

From what source or precedent is California's policy and/or implementation procedure derived that the State will "only [implement a project] when enough funds have been collected"? Is that an adopted policy and/or written implementation procedure? What is the meaning of the phrase "enough funds"? Would the State allow a National Highway System (NHS) Improvement project to proceed absent evidence of sufficient funding for the totality of the identified improvements? Is the proposed project intended to be constructed as a phased undertaking (e.g., spend the available money now and defer later improvement until funds become available at a later date) or constructed as a single set of improvements? Does the "project sponsor" have sufficient dedicated and budgeted funds to implement any of the alternatives? Is it Caltrans' intent to select a PA and then look for the money to pay for it?

What is the meaning of the word "implement"? What does "implement" mean in the context of a separate "project sponsor" paying or substantially contributing to the cost of those improvements? Clearly, Caltrans has initiated a CEQA/NEPA process, including the preparation of associated engineering studies and design drawings, with only an estimated \$600,000 in available Renewed Measure M Program (M2) funding. How is the introduction of alternatives whose costs exceed that number consistent with the above policy declaration?

Notwithstanding the above statement, neither the project's described "purpose and need" nor the project's stated "objectives" include any declaration or inference that funding may be a controlling or contributing factor with regards to alternative selection. What role does funding

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play in Caltrans' selection of its chosen alternative? Is it presently the State's intent to full all or a portion of the proposed I-405 Freeway improvements?

As indicated in correspondence from William Kempton, OCTA's CEO to OCTA's Regional Planning and Highway Committee (Subject: Update on the Interstate 405 Improvement Project Alternatives, Business Models, and Delivery Option), dated April 16, 2012, current project cost estimates and funding options are described below:

For Alternatives 1 and 2, the total estimated project cost is \$1.3 billion and \$1.4 billion, respectively. As the M2 revenues for this project are currently estimated to be \$600 million over the life of the M2 program, this leaves an estimated funding need of \$700 million for Alternative 1 and \$800 million for Alternative 2. For Alternative 3, the express lanes alternative, the total estimated project cost is \$1.7 billion. Alternative 3 is approximately two miles longer than the other two alternatives and includes an Express Lanes direct connector between the I-405 and the SR-73, and would require additional Intelligent Transportation System components to operate the Express Lanes facility. Alternative 3 delivers congestion management via tolling to provide the public with the option of a guaranteed speed and travel time through the corridor. Alternative 3 provides for greater vehicle throughput, as vehicles travelling at or near the speed limit in the Express Lanes will move through the corridor in greater numbers than vehicles in slower moving general purpose lanes. With the same M2 revenues of \$600 million for the Express Lanes Alternative, the funding need is approximately \$1.1 billion.

As indicated in the DEIR/S: "Alternative 4 [was] proposed to provide localized improvements within the I-405 corridor that could be fully funded and implemented with available revenue from Orange County's Renewed Measure M transportation sales tax initiative" (DEIR/S, pp. 2-3 and 4); however, "Alternative 4 would neither provide additional capacity along the entire corridor nor enhance interchange operations. It would not meet the project purpose and was eliminated from further consideration in this Draft EIR/EIS" (DEIR/S, p. 2-4). If the proposed project's origins are directly linked to Measures M/M2 and if implementation of Measure M/M2 improvements and cost constraints are deemed inconsistent with the "project purpose," then it is obvious that the stated purpose is wrong and the totality of the CEQA/NEPA analysis fatally flawed.

As indicated, the only alternative that could be "implemented with available revenues" was eliminated prior to the publication of the DEIR/S (e.g., "Funding options to address the shortfall are currently under study," DEIR/S, p. 1-18).

Based on that information, there is presently insufficient funding for the completion of any of the three build alternatives described in the DEIR/S and SDEIR/S. Acknowledging that funding is currently insufficient for any of the alternatives, how does Caltrans reconcile the statement that the State will not precede with the advancement of any project until such time as sufficient funds have been committed? Could the "project sponsor" (e.g., "The term 'project sponsor' means the agency or other entity, including any private or public-private entity, that seeks approval of the Secretary for a project" [emphasis added], 23 U.S.C. 139[a](7)) or another party, proceed with the preparation of detailed engineering drawings, solicitation for a design-build contractor, and/or contract award for a project prior to the State's receipt of a commitment for full project funding?

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7.12 TDM/TSM and Other Alternatives

The Lead Agency continues to misrepresent that inclusion of a transportation system management (TSM) and transportation demand management (TDM) alternative is presented in the DEIR/S and SDEIR/S. The SDEIR/S asserts that "[a] stand-alone Transportation System Management (TSM)/Transportation Demand Management (TDM) Alternative was identified for the corridor" (p. 2-8); however, "[i]t does not meet the project purpose and is described in Section 2.2.7, Alternatives Considered but Eliminated from Further Discussion" (DEIR/S, p. 2-22). The entire analysis comprises about one page and concludes that "[t]he TSM/TDM Alternative is not considered a viable option because it does not fulfill the project purpose" (DEIR/S, p. 2-50).

The mandate of Measure M is to "make best use of available freeway property, update interchanges and widen all local overcrossings according to city and regional master plans" (emphasis added) (Measure M, Project K). The term "best use" is not specifically defined therein nor does it contain language which limits Measure M-eligible projects exclusively to new freeway lane additions.

Because factors relating to "efficiency" and "effectiveness" are neither part of the project's stated purpose nor a performance criterion against which alternatives are to be examined and since cost appears not to have been a factor in alternative formulation, neither Caltrans nor the OCTA ever appear to contemplate (from a transportation investment perspective) "what is the 'best use' of Measure M resources?" Since the question is never asked and since only "build more freeway lanes" is ever considered, it is not possible to ascertain whether \$1 spend on public transportation would reap higher returns (e.g., Smart Mobility benefits) than that same \$1 spend on freeway lane expansion. As a result, to the extent that Caltrans and OCTA assert a nexus between the proposed project and Measure M, the Lead Agency has artificially narrowed the range of reasonable alternatives that need to be considered under CEQA/NEPA.

Clearly, an alternative to adding more lane capacity is fewer vehicles. If the Lead Agency's objective is to reduce congestion, while it may seem counterintuitive, one of the performance measures that would appear applicable related to the number of privately-operated vehicles or vehicle trips removed from the affected roadway and the number of such trips that are converted to transit-based trips.

Since "congestion" is a symptom of a larger mobility problem and not its root cause, setting a goal of reducing congestion (i.e., "Reduce congestion," DEIR/S, p. 1-5) is analogous to putting a band-aid on a terminally ill patient in that it may temporarily cover the physical manifestations of the illness but does not promote either a cure or lasting remedy. As indicated in the DEIR/S and SDEIR/S, between now and 2020, traffic problems along the I-405 Freeway will grow such that the improvements will already be outdated once they are completed. It is unlikely that the County's voters elected to tax themselves for actions that will not meaningfully benefit the majority of County motorists.

If Caltrans and OCTA wish to implement a HOTL project using Measures M/M2 funds, since there exists no reference to tolling in those ballot measures and since funding cannot be so differentiated as to segregate Measures M/M2 funds from the total cost of project improvements, independent of any memorandum from legal counsel, why would OCTA's Board of Directors not seek input from County voters whether such an expenditure is consistent with the voters' earlier directives?

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What factual basis exists to support a determination that Alternative 1 constitutes the "best use of available freeway property"? What factual basis exists to support a determination that Alternative 2 constitutes the "best use of available freeway property"? What factual basis exists to support a determination that Alternative 3 constitutes the "best use of available freeway property"?

7.13 CEQA Considerations Relating to Supplemental EIRs

Referencing Section 21166 of CEQA:

When an environmental impact report has been prepared for a project pursuant to this division, no subsequent or supplemental environmental impact report shall be required by the lead agency or by any responsible agency, unless one or more of the following events occurs: (a) Substantial changes are proposed in the project which will require major revisions of the environmental impact report. (b) Substantial changes occur with respect to the circumstances under which the project is being undertaken which will require major revisions in the environmental impact report. (c) New information, which was not known and could not have been known at the time the environmental impact report was certified as complete, becomes available (emphasis added).

Section 21166 of CEQA applies only after an environmental impact report (EIR) has been certified (which is not the case herein). Prior to certification, Section 21092.1 of CEQA applies. As indicated therein:

When significant new information is added to an environmental impact report after notice has been given pursuant to Section 21092 and consultation has occurred pursuant to Sections 21104 and 21153, but prior to certification, the public agency shall give notice again pursuant to Section 21092, and consult again pursuant to Sections 21104 and 21153 before certifying the environmental impact report" (emphasis added).

With regards to the use of a subsequent (Section 15162), supplemental (Section 15163), or an addendum (Section 15164) to an EIR, a California appellate court has ruled that "[a]ll three cited guidelines refer to preparation of documents after the certification of an EIR. These documents are prepared only when, subsequent to certification, changed circumstances occur or when new information, which was not known and could not have been known when the original EIR was certified, becomes available [Citation]" (Galante Vineyards v. Monterey Peninsula Water Management District [1998]). In Bowman v. City of Petaluma (1986), the court noted: "We question the applicability of section 21166 where the original EIR has not been finally certified as complete. (See Stevens v. City of Glendale [Citation] [where certification of EIR was vacated, it would be 'premature' to require a supplemental EIR]."

As a result, unlike NEPA (40 CFR 1502.9(c)), under CEQA, Caltrans is precluded from preparing a "Supplemental Draft Environmental Impact Report" (emphasis added). No "supplemental draft" EIR exists under CEQA or its implementing guidelines. As such, any reference thereto is a misnomer and only serves to misrepresent the precise nature of the current CEQA document to affected stakeholders.

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7.14 Recirculated DEIR/S

As indicated in the SDEIR/S: "As a result of comments received during circulation of the Draft EIR/EIS on project-related traffic effects within the City of Long Beach, and new information, analysis, and project effects in the Supplemental Traffic Study, Caltrans, as the Lead Agency, made the decision to disclose this new information to the public by preparing and circulating this Supplemental Draft EIR/EIS. The [State] CEQA Guidelines Section 15088.5(c) allow for the lead agency to recirculate an environmental document that has been modified and address the new information that is the basis for the recirculation" (p. 8-1).

To add to the confusion as to the precise nature and intent of the document, the Lead Agency refers to the SDEIR/S as both a "supplemental draft" and a "recirculate[d]" environmental document. As the SDEIR/S (pp. S-1 and S-2, see also 1-2 and 1-3) further notes:

This Supplemental Draft EIR/EIS only includes supplemental information, as applicable, for relevant sections related to the new information described in Table S-1 below.

Table S-1: Summary of Draft EIR/EIS Sections
Addressed in the Supplemental Draft EIR/EIS

Section	Change
3.1.6 Traffic and Transportation/ Pedestrian and Bicycle Facilities	Discussion added as a result of the Supplemental Traffic Study
3.6 Cumulative Impacts	Discussion added as a result of the Supplemental Traffic Study
4.0 California Environmental Quality Act Evaluation	Discussion added as a result of the Supplemental Traffic Study

If the SDEIR/S only seeks to augment the three above referenced sections, then there exists a substantial amount of tangential information whose purpose and intent remain unclear and whose integration into the DEIR/S remains unexplained. Since the formatting of the DEIR/S and the SDEIR/S are not internally consistent and since the Lead Agency has elected to present separate and independent subheadings and numbering in the SDEIR/S which are not reflective of the DEIR/S, the two documents are not organized in a manner which allows stakeholders to understand: (1) what significant new information is actually being introduced; and (2) how the DEIR/S has been augmented or otherwise modified to reflect the information and analysis presented in the SDEIR/S.

With the exception of the following sections, it is unclear how the Lead Agency seeks to integrate the remainder of the SDEIR/S into the DEIR/S:

- Section 3.1.6 Traffic and Transportation/Pedestrian and Bicycle Facilities. In Chapter 3 (Environmental Setting, Consequences, and Avoidance, Minimization, and Mitigation Measures) of the SDEIR/S, the Lead Agency states that "[t]he following is additional information for Draft EIR/EIS Section 3.1.6, Traffic and Transportation/Pedestrian and Bicycle Facilities. This information will be added to Section 3.1.6, Traffic and Transportation/Pedestrian and Bicycle Facilities of the Final EIR/EIS" (p. 3-1).

The analysis presented in the SDEIR/S is not, however, consistent with the analysis presented in the DEIR/S. For example, the DEIR/S states that the "[a]nalysis of vehicle

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queues was conducted for AM and PM peak hours at four types of locations" (emphasis added) (DEIR/S, p. 3.1.6-1). In contrast, the SDEIR/S states that the "[a]nalysis of vehicle queues was conducted for AM and PM peak hours at three types of locations" (emphasis added) (p. 3-2). Although none of the freeway ramps in the expanded "study area" were examined in the DEIR/S, without explanation, the analysis of "[v]ehicle storage at freeway on-ramp meters" (DEIR/S, p. 3.1.6-2) was excluded from the SDEIR/S. In addition, with regards to the freeway mainline within the "Long Beach study area," integration of the two documents is made difficult since other analyses presented in the DEIR/S (e.g., "peak-hour performance," DEIR/S, p. 3.1.6-21; "daily vehicle miles traveled," DEIR/S, p. 3.1.6-22; "corridor travel times," DEIR/S, pp. 3.1.6-25 and 26; "traffic accident data," DEIR/S, p. 3.1.6-27; "pedestrian and bicycle facilities," DEIR/S pp. 3.1.6-34 and 35) have not been repeated or modified based on the information and analysis presented in the SDEIR/S.

- **Section 3.6 Cumulative Impacts.** In Section 3.2 (Cumulative Impacts) of the SDEIR/S, the Lead Agency notes: "The following is additional information for Draft EIR/EIS Section 3.6, Cumulative Impacts under Subsection 3.6.5.7, Traffic and Transportation/Pedestrian and Bicycle Facilities. This information will be added to Section 3.6.5.7 of the Final EIR/EIS" (p. 3-92).

Section 3.6 consists of only two pages (pp. 3-92 and 3-93). As a result, the cumulative impact analysis presented in the DEIR/S is only "supplemented" by the referenced pages in the SDEIR/S.

- **Section 4.0 California Environmental Quality Act Evaluation.** In Chapter 4 (California Environmental Quality Act Evaluation), the Lead Agency notes: "The following is additional information for Draft EIR/EIS Section 4.2.3, Significant Environmental Effects of the Proposed Project, under Subsection 4.2.3.5, Transportation/Traffic Checklist Questions a) – b). This information will be added to Section 4.2.3.5 of the Final EIR/EIS" (p. 4-1). In addition, Section 4.2 (Mitigation Measures for Significant Impacts under CEQA notes: "The following is additional information for Draft EIR/EIS Section 4.2.8, Mitigation Measures for Significant Impacts under CEQA. This information will be added to Section 4.2.8 in the Final EIR/EIS. With implementation of the proposed traffic measures below, the project contribution to significant cumulative impacts would be mitigated" (pp. 4-26 and 27).

Comments concerning the adequacy of the DEIR/S' and SDEIR/S' compliance with CEQA are presented elsewhere herein.

The State CEQA Guidelines present agencies with two options with regards to "recirculation of an EIR prior to certification" (14 CCR 15088.5). As stipulated therein:

(1) When an EIR is substantially revised and the entire document is recirculated, the lead agency may require reviewers to submit new comments and, in such cases, need not respond to those comments received during the earlier circulation period. The lead agency shall advise reviewers, either in the text of the revised EIR or by an attachment to the revised EIR, that although part of the administrative record, the previous comments do not require a written response in the final EIR, and that new comments must be submitted for the revised EIR. The lead agency need only respond to those comments submitted in response to the recirculated

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revised EIR. (2) When the EIR is revised only in part and the lead agency is recirculating only the revised chapters or portions of the EIR, the lead agency may request that reviewers limit their comments to the revised chapters or portions of the recirculated EIR. The lead agency need only respond to (i) comments received during the initial circulation period that relate to chapters or portions of the document that were not revised and recirculated, and (ii) comments received during the recirculation period that relate to the chapters or portions of the earlier EIR that were revised and recirculated. The lead agency's request that reviewers limit the scope of their comments shall be included either within the text of the revised EIR or by an attachment to the revised EIR.

As presented and as organized, the SDEIR/S neither constitutes "the entire EIR" (14 CCR 15088.5(f)(1)) nor the "revised chapters or portions thereof" (14 CCR 15088.5(f)(2)). As such, since the SDEIR/S is neither of the two authorized versions, the Lead Agency cannot then stipulate that previous public and agency comments submitted in response to the DEIR/S no longer "require a written response" or that comments submitted in response to the release of the SDEIR/S be confined to the "revised chapters or portions."

7.15 Feasibility

Conclusions presented in the SDEIR/S relating to the proposed project's post-mitigated level of significance are predicated on unspecified future events, such that the document is written in a fashion whereby the Lead Agency can avoid implementing the mitigation measures which it purports to be necessary to reduce otherwise significant environmental impacts to a less-than-significant level (e.g., "With implementation of the proposed traffic measures below, the project contribution to significant cumulative impacts would be mitigated," p. 4-27). As indicated in the SDEIR/S:

Funding from additional sources will be required to fully fund implementation of each of the improvements proposed in Measures T-10 and T-11. It is unsure at this time if and when 100 percent of the funding will be available to implement each intersection identified in Mitigation Measures T-10 and T-11 because they are dependent on mitigation funds from future developments and projects in the area. The Department is committed to the fair share funding percentages as stated below. However, if the City of Long Beach and the State of California are unable to get 100 percent of the remaining funds, then Measure T-10 and/or Measure T-11 will be deemed infeasible due to impacts identified as significant and not fully mitigable; consequently, Findings and a Statement of Overriding Considerations would be prepared for inclusion in the Final EIR/EIS to comply with State CEQA Guidelines (Title 14 California Code of Regulations, Chapter 3, Section 15903), and the Department of Transportation and California Transportation Commission Environmental Regulations (Title 21 California Code of Regulations, Chapter 11, Section 1501) (emphasis added) (p. 4-27).

The above statement appears inconsistent with the Lead Agency's declaration that "[w]ith implementation of the fair share agreement within 90 days of publication of the project's Record of Decision (ROD) and payment of related funding prior to construction, as described in proposed traffic measures T-10 and T-11, the project's contribution to adverse cumulative effects within the Supplemental Draft EIR/EIS study area at the affected locations would be minimized" (p. 3-93).

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Is the Lead Agency asserting that the term "minimized" is synonymous with "reduced to below a level of significance"? Are traffic-related impacts within the "Long Beach study area" deemed to be "significant" in the absence of Measures T-10 and T-11 and "less than significance" once those mitigation measures are implemented?

Since it is unlikely that either Long Beach or the State can demonstrate the availability of 100 percent of dedicated and committed funds for specified roadway improvements (e.g., "It should be noted that the State of California would implement a project only when enough funds have been collectively received for the specified mitigation measure," p. 3-89), the Lead Agency appears to be inclined to deem the identified mitigation measures infeasible and avoid the payment of its fair-share contributions thereunder. No private "project sponsor" can so condition its mitigation obligations (as specified both under CEQA and the County's "Congestion Management Program") so as to: (1) independently determine whether it bears any obligation to fully or proportionately address the impacts of its own actions; (2) condition the mitigation measure on the performance of other parties not related to the proposed project; and/or (3) defer performance to an unspecified later date, bearing no time-dependent nexus between the impacts of its actions and the faithful implementation of the stated mitigation measure.

Under CEQA, mitigation measures (14 CCR 15126.4[a][1]) and project alternatives (14 CCR 15126.6[c]) must be deemed feasible. In addition, mitigation measures must be fully enforceable through permit conditions, agreements, or other legally-binding instruments (14 CCR 15126.6[2]). To the extent that the Lead Agency were to subsequently deem Measures T-10 and T-11 to be "infeasible," those recommendations actions would not constitute valid mitigation measures under CEQA. Since no additional or alternative measures are presented in the SDEIR/S, the Lead Agency would violate CEQA's primary tenet not to prevent or minimize environmental damage (14 CCR 15021).

Similarly, public agencies tasked with mitigation (e.g., "That the proposed improvements shall be implemented by the City of Long Beach, with the City of Long Beach bearing responsibility for necessary clearances and permits," Mitigation Measure T-10) should be provided reasonable flexibility in the manner in which that implementing agency elects to compensate for a project's identified impacts. Independent of the location specified, a public agency might elect to undertake comparable improvements in another location so as to reduce traffic to a comparable amount; however, as drafted, the identified mitigation measures unreasonably limits a Responsible Agency's discretionary authority by stipulating that any allocated funds are restricted to only the location noted (e.g., "That the payment made by OCTA shall be placed into the City of Long Beach Transportation Mitigation Program and shall only be used to provide improvements to remedy impacts of the PA at the intersections listed below," Mitigation Measure T-10; "That the payment made by OCTA shall be held by Caltrans and shall only be used to provide improvements to remedy impacts of the PA at the intersections listed below," Mitigation Measure T-11).

7.16 Improper Delegation of Authority

As specified under Section 15100(b) of the State CEQA Guidelines, "[p]ublic agencies should carry out their responsibilities for preparing and reviewing EIRs." As further specified under Section 15025 of the State CEQA Guidelines:

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(a) A public agency may assign specific functions to its staff to assist in administering CEQA. Functions which may be delegated include but are not limited to: (1) Determining whether a project is exempt. (2) Conducting an Initial Study and deciding whether to prepare a draft EIR or Negative Declaration. (3) Preparing a Negative Declaration or EIR. (4) Determining that a Negative Declaration has been completed within a period of 180 days. (5) Preparing responses to comments on environmental documents. (6) Filing of notices. (b) The decision-making body of a public agency shall not delegate the following functions: (1) Reviewing and considering a final EIR or approving a Negative Declaration prior to approving a project. (2) The making of findings as required by Sections 15091 and 15093. (c) Where an advisory body such as a planning commission is required to make a recommendation on a project to the decision-making body, the advisory body shall also review and consider the EIR or Negative Declaration in draft or final form."

The administrative records suggests or demonstrates that there has been an improper delegation of authority with regards to the proposed project. As indicated in the SDEIR/S: "The Department is the lead agency under the California Environmental Quality Act and National Environmental Policy Act. The Orange County Transportation Authority is the project sponsor" (General Information about this Document, unpaginated). However, the DEIR/S notes that "[a]fter the public circulation period for the Draft EIR/EIS, all comments will be considered, and the Project Development Team (PDT) will select a preferred alternative and make the final determination of the project's effect on the environment" (emphasis added) (DEIR/S, p. 2-27).

It is not believed that the PDT is the decision-making body of Caltrans and accountable to any constituency for their actions. Additionally, neither the composition of nor the criteria that the PDT will use in making that "final determination" and selecting the "preferred alternative" (e.g., "CEQA requires that decisions be informed and balanced," 14 CCR 15003[j]) have been identified. As a result, assigned roles and delegated responsibilities with regards to both the project's approval and the "final determination" regarding the significance of environmental and socioeconomic impacts appear inconsistent with statutory and regulatory requirements.

Is the PDT Caltrans' designated "advisory body" or "advisory committee"? Who determined the composition of the PDT and when and who appointed its members? Specifically, by name and agency affiliation, what is the PDT's membership? Are the PDT's deliberations publicly noticed and open to the general public? With regards to the proposed project, what role has the PDT played to date and where are the official records of that body located? Are the PDT's meeting recorded or taped and, if so, who is the custodian of those records? Is the proposed action a "Category 1" or "Category 2" project and what specific procedures apply to decisions concerning those projects? What is the composition of Caltrans' decision-making body? What role, if any, does the CTC have in the selection of the "preferred alternative" and "final determination"?

8.0 AREAS AND FACILITIES OF SPECIFIC CONCERN

8.1 College Park East

As indicated in correspondence from Jim Beil, Executive Director, Capital Projects of OCTA to the City's Director of Public Works, dated June 25, 2013, included herein as Attachment 2 (Correspondence from Jim Beil, OCTA Executive Director, June 25, 2013), OCTA notes that the existing Almond Avenue would be removed and relocated under Alternative 2 and that the City's

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requested "design exceptions," formulated to allow for the retention of that soundwall should Alternative 2 be selected, have been rejected by the OCTA. Discussions in this letter, included review of City provided Alternatives, review of City proposed Mandatory and Advisory Exceptions, Project relocated Soundwall and Almond Avenue Impacts, and discussion of accident data. The June 2013 Supplemental Draft EIR/EIS report did not include any discussions of the City proposed alternatives, requested studies, and impacts to Almond Avenue. However, the December 2012 Draft Supplemental Traffic Study Report does address many of the City Alternatives. This information was omitted in the June version and should be included. As a result, Seal Beach does not support the Lead Agency's selection of Alternative 2 as the "preferred alternative" and requests that Caltrans reject and cease all activities in furtherance Alternative 2.

8.2 College Park West

The SR-22/7th Street Ramp at College Park Drive is discussed in Alternatives 1 and 2, but not included in Alternative 3. A discussion is requested for the elimination of any project impacts to this intersection for Alternative 3. The traffic remains relatively constant for each Alternative.

Figure 3-2 does not correctly show the lane configuration at the intersection of SR-22/7th Street and College Park Drive. In addition, the December 2012, Supplemental Traffic Study analysis did not reflect the current lane configuration for the developed Model. A traffic signal is proposed at this intersection. Previously, the City of Seal Beach contacted Caltrans District 7 and Headquarters to install a traffic signal at this location. It was denied with Caltrans citing the backup onto SR-22/7th Street causes a safety concern. The report does not model an issue caused by placing a traffic signal at this location nor was an Agreement with Caltrans provided with this option. Since the City was previously denied by Caltrans, an Agreement with Caltrans to install a traffic signal at this location before it is provided as a mitigation measure.

Since College Park West neighborhood, located to the north west of the I-405/I-605 Freeway interchange, has only a single means of vehicular access (i.e., College Park Drive) and since the northbound on-ramp and off-ramp configurations for Studebaker Road which has been proposed by Caltrans creates access, mobility, and safety concerns both for that neighborhood and for freeway motorists, Seal Beach has formulated an alternative street and ramp configuration which enhances access, mobility, and public safety. This plan is identical to the City of Long Beach Alternative for a direct connect ramp to Studebaker Road and separating it from College Park Drive. College Park Drive also connected directly to Studebaker Road.

In lieu of the design plan presented in the SDEIR/S (Figure 4-6), the City requests that Caltrans adopt the alternative street and ramp configuration that is presented as Attachment 6 (Studebaker Road/College Park Drive Alternative Street and Ramp Configuration) herein.

8.3 HOT Lanes

Based on the proposed access limitation to the managed lanes, neither Seal Beach nor its residents and business community would benefit from the implementation of Alternative 3. For those and for the reasons articulated in the City's responses to the DEIR/S and SDEIR/S, Seal Beach does not support the Lead Agency's selection of Alternative 3 as the "preferred alternative" and requests that Caltrans reject and cease all activities in furtherance of Alternative 3.

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9.0 ADDITIONAL DOCUMENTS CITED (Partial Listing)

9.1 Publications

- California Debt and Investment Advisory Commission, Final Foothill/Eastern Transportation Corridor Agency Foothill/Eastern Toll Road Project – Proposed 2013 Restructuring Financial Advisor Evaluation, July 3, 2013.
- California Department of Transportation, Bus Rapid Transit: A Handbook for Partners, February 2007.
(<http://www.dot.ca.gov/hq/MassTrans/Docs-Pdfs/BRT/BRT-Handbook-030706.pdf>)
- California Department of Transportation, California HOV/Express Lane Business Plan, 2009, March 31, 2009.
(http://www.accma.ca.gov/Documents/22_136_74A0371_ExpressLaneBizPlan_033109_FINAL_check__2_.pdf)
- California Department of Transportation, California Interregional Blueprint, Interim Report, December 2012.
(http://www.dot.ca.gov/hq/tpp/californiainterregionalblueprint/Documents/cib_interim_report/CIB_interim_Report_022613.pdf#zoom=65)
- California Department of Transportation (System Metrics Group/Braidwood Associates), Corridor System Management Plan - State Route 22/Interstate 405/Interstate 606 Final Report, August 2010.
(http://www.dot.ca.gov/hq/tpp/corridor-mobility/CSMPs/d12_CSMPs/SR%2022-1%20405-1%20606/D12_SR-22_CSMP_Final_Technical_Report_dec2010.pdf)
- California Department of Transportation, Draft Final Corridor System Management Plan Orange County SR-22 Comprehensive Performance Assessment and Causality Analysis, May 4, 2009.
(http://www.dot.ca.gov/hq/tpp/corridor-mobility/CSMPs/d12_CSMPs/SR%2022-1%20405-1%20606/SR-22%20%20I-405%20%20I-605%20CPA.pdf)
- California Department of Transportation, Draft Supplemental Traffic Study Report – San Diego Freeway (I-405) Improvement SR74 to I-605, December 2012.
- California Department of Transportation, Fact Sheet: Exceptions to Advisory Design Standards – I-405 Improvement Project, April 2012.
- California Department of Transportation, Guidance of Preparers of Cumulative Impact Assessments, updated February 3, 2012.
(http://www.dot.ca.gov/ser/cumulative_guidance/purpose.htm)
- California Department of Transportation, Impacts of Increasing Vehicle-Occupancy Requirements on HOV/HOT Lanes, March 25, 2013.
(http://www.dot.ca.gov/hq/newtech/researchreports/preliminary_investigations/docs/HOV_and_HOT_Lanes_Preliminary_Investigation_03-25-13.pdf)
- California Department of Transportation, Interregional Transportation Strategic Plan – Review Draft, December 2012.
(http://www.dot.ca.gov/hq/tpp/offices/oasp/ITSP_document_FINAL.pdf#zoom=65)
- California Department of Transportation, Public Notice – Supplemental Draft Environmental Impact Report/Environmental Impact Statement Available for Interstate 405 & Announcement of Public Hearing, undated.
(http://www.octa.net/pdf/405Supplemental_PublicNotice.pdf)
- California Department of Transportation, Route Concept Report Interstate 405 – San Diego Freeway, November 1999.
(<http://www.dot.ca.gov/dist12/planning/pdf/route405.pdf>)

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- California Department of Transportation, Smart Mobility 2010 – A Call to Action for the New Decade, February 2010.
(http://www.dot.ca.gov/hq/tpp/offices/ocp/documents/smf_files/SMF_handbook_062210.pdf),
- California Department of Transportation, Updated Managed Lane Design, April 7, 2011.
(<http://www.dot.ca.gov/hq/traffops/signtech/signdel/policy/11-02.pdf>)
- California Transportation Commission, Statewide Transportation Systems Needs Assessment – Final Report, October 2011.
(http://www.ctac.ca.gov/reports/2011/Needs_Assessment_updated.pdf)
- Chum, Geoffrey L. and Buris, Mark W., Potential Mode Shift from Transit to Single-Occupancy Vehicles on a High-Occupancy Toll Lane, Transportation Research Record: Journal of the Transportation Research Board, No. 2072, 2008.
- Federal Highway Administration, Federal-Aid Highway Program Guidance on High-Occupancy Vehicle (HOV) Lanes, November 2012.
(<http://ops.fhwa.dot.gov/freewaygmt/hovguidance/hovguidance.pdf>)
- Federal Highway Administration, NEPA and Transportation Decisionmaking – Developing and Evaluation of Alternatives, November 15, 2006.
(<http://environment.fhwa.dot.gov/projdev/tdmalts.asp>)
- Federal Highway Administration, NEPA and Transportation Decisionmaking – The Development of Logical Project Termini, November 5, 1993.
(<http://environment.fhwa.dot.gov/projdev/tdmtermini.asp>)
- Federal Highway Administration, Reference Sourcebook for Reducing Greenhouse Gas Emissions from Transportation Sources, February 2012.
(<http://ops.fhwa.dot.gov/freewaygmt/publications/hov/00101625.pdf>)
- National Center for Transit Research, Integrating Transit and Road Pricing Projects Final Report, June 2013.
(http://www.dot.state.fl.us/research-center/Completed_Proj/Summary_PTO/FDOT-BDK85-977-43-rpt.pdf)
- Orange County Transportation Authority (Parsons), Interstate 405 Major Investment Study Final Report, February 2006.
- Small, Kenneth A. and Ng, Chen Feng, Optimizing Road Capacity and Type, June 1, 2013
(<http://www.tollroadsnews.com/sites/default/files/Small&NgOptimizingHwys.doc>)
- Southern California Association of Governments, 2012-2035 Regional Transportation Plan/Sustainable Communities Strategy, April 4, 2012.
- Transportation Research Board, Research Needs Statement, posted January 6, 2010.
(<http://trb.org/dproject.asp?n=24742>)
- United States Department of Transportation, Integrating Demand Management in the Transportation Planning Process: A Desk Reference, August 2012.
(<http://ops.fhwa.dot.gov/publications/fhwahop12035/fhwahop12035.pdf>)

9.2 California Cases

- Bowman v. City of Petaluma (1986)
- Galante Vineyards v. Monterey Peninsula Water Management District (1998)

10.0 ATTACHMENTS

- 1 California Department of Transportation, December 2012 Supplemental Traffic Study, December 2012

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- 2 Correspondence from Jim Beil, OCTA Executive Director, June 25, 2013
- 3 Orange County Transportation Commission, High-Occupancy Vehicle Degradation Study Powerpoint, April 8, 2013
- 4 City of Long Beach, I-405 Freeway Improvement Project Letter and Memorandum, July 17-18, 2012
- 5 Kenneth A. Small and Chen Feng Ng, Optimizing Road Capacity and Type, June 1, 2013
- 6 City of Seal Beach, Studebaker Road/College Park Drive Alternative Street and Ramp Configuration, July 2013

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SUPPLEMENTAL
TRAFFIC STUDY REPORT

San Diego Freeway (I-405) Improvement Project
SR-73 to I-605

Orange and Los Angeles Counties



December 2012



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I-405 Improvement Project Supplemental Traffic Study

Introduction

I-405 Improvement Project Supplemental Traffic Study

Alternative 3 Modified

INTRODUCTION

The purpose of the Supplemental Traffic Study Report (Supplement) is to provide additional traffic information on the I-405 Improvement Project not included in the *Traffic Study Report – San Diego Freeway (I-405) Improvement Project SR-73 to I-605* completed by Albert Grover & Associates in April 2011 (Traffic Study). These improvements were included as a result of public comments during the Draft Environmental Impact Report/Environmental Impact Statement (EIR/EIS) circulation. This Supplement will be included in the Final EIR/EIS. In addition to this Introduction, this Supplement contains four sections, numbered and providing additional traffic information on the four topics in the list below:

1. Alternative 3 Modified. Section 1 provides traffic analysis assuming truncation of the Express Lanes near the Euclid Street interchange. Alternative 3 Modified also includes an optional design of the Magnolia/Warner interchange that does not include braided ramps and a modification to the northbound merge of the direct connector from westbound SR-22 into the Express Lanes.
2. Alternative 1 Magnolia/Warner Interchange. Section 2 provides traffic analysis of design options for the Magnolia/Warner interchange that do not include braided ramps.
3. Operational Analysis Northbound Approaching I-605. Potential for operational difficulties northbound on I-405 at I-605 is analyzed. As the build alternatives approach the LA County line, the additional lanes proposed in each of the build alternatives continue into receiving lanes on branch connectors to SR-22/7th Street westbound and I-605 northbound. If more motorists desire to continue northbound on I-405 in LA County than the freeway can handle as the additional lanes exit to SR-22/7th Street and I-605, there is the potential for a bottleneck to occur.
4. Long Beach Area Traffic Study. Traffic changes in the Long Beach area along SR-22/7th Street, I-405, and I-605, at their local interchanges, and at nearby intersections due to the proposed build alternatives are evaluated. The study area includes Carson Street in the vicinity of I-605 which, in addition to the City of Long Beach, includes the Cities of Lakewood and Hawaiian Gardens.

Each of the four sections is independent and complete on its own with respect to its topic. References are made as necessary to the Traffic Study to avoid extensive duplication of topics fully covered in that report. Each of the four topics covered in this Supplement is more fully defined in their respective sections of this Supplement. All of the figures and tables associated with a section are presented at the end of the section, with the figures following the text and the tables at the end of the section. Appendices are provided electronically.

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1.0 ALTERNATIVE 3 MODIFIED

Alternative 3 Modified was introduced during the environmental process by Orange County Transportation Authority (OCTA), the project sponsor, to address public comments received during the public circulation of the Draft EIR/EIS.

Alternative 3 Modified would add one GP lane in each direction on I-405 from Euclid Street to the I-605 interchange (as in Alternatives 1 and 2), plus add a tolled Express Lane in each direction of I-405 from Euclid Street to SR-22 East. The tolled Express Lane and the existing HOV lanes would be managed jointly as a tolled Express Lane Facility with two lanes in each direction from Euclid Street to I-605. The Express Lanes would encourage carpooling by providing discounted tolls for HOVs with 3 or more occupants. Alternative 3 Modified removes the direct connector from SR-73 to I-405.

Auxiliary lanes would be provided at the following locations on I-405:

- Northbound to the Euclid Street off-ramp from a point 1200' south of the off-ramp;
- Northbound from the Magnolia Street on-ramp to the Beach Boulevard off-ramp;
- Northbound from the Seal Beach Boulevard on-ramp to the SR-22 Westbound/7th Street off-ramp;
- Southbound from the SR-22/7th Street on-ramp to Seal Beach Boulevard off-ramp;
- Southbound from the Magnolia Street on-ramp to a point south of the Warner Avenue off-ramp;
- Southbound from the Euclid Street on-ramp to Harbor Boulevard off-ramp; and
- Southbound from the Harbor Boulevard on-ramp to the Fairview Road off-ramp.

The existing northbound auxiliary lane from Magnolia Street to Beach Boulevard will be retained. The existing southbound auxiliary lanes from SR-22/7th Street to Seal Beach Boulevard and from Harbor Boulevard to Fairview Road will be retained, and the existing southbound auxiliary lane from the Beach Boulevard interchange to the Magnolia Street interchange would be incorporated as part of the new southbound general purpose lane.

A design option is also proposed for the northbound I-405 ramps between Warner Avenue and Magnolia Street. The design option proposes to modify the existing collector-distributor (C-D) system by providing an exclusive exit ramp for the northbound loop Off-Ramp to Warner Avenue and beginning the collector distributor road just downstream from the exit ramp to Warner Avenue. The C-D road consists of two lanes providing for a one lane entrance ramp from Warner Avenue and two lane exit ramp to Magnolia Street. Analysis for the design option is presented in Section 1.7.

Alternative 3 Modified would include the same interchange improvements included in Alternative 3 except for minor lane designations on southbound Magnolia Street at the I-405 southbound ramp intersection. The analysis presented here assumes that there are not braided

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ramps in the southbound direction at the Magnolia Street/Warner Avenue interchange and that there is a southbound auxiliary lane starting from the loop on-ramps from Magnolia Street and continuing south of the Warner Avenue off-ramp before terminating north of the Warner Avenue on-ramp. This design option was suggested to retain business (Boomers, Fountain Valley Skate Center, Days Inn and Sports Authority).

Express Lane Access

To facilitate access to the Express Lane Facility, the following six access points are currently under consideration on:

1. I-405 near Euclid Street, by an at-grade access;
2. I-405 in the Magnolia Street/Warner Avenue area, by an at-grade access;
3. I-405 in the Bolsa Avenue/Goldenwest Street area, by an at-grade access;
4. SR-22 east of the I-405 junction, by a direct connector;
5. I-605 north of the I-405 junction, by a direct connector; and
6. I-405 north of the I-605 junction, by an at-grade access.

Access to the Express Lane Facility from SR-22 and I-605 would be via the HOV direct connectors to be constructed as part of the SR-22 West County Connectors (WCC) Project. Under Alternative 3 Modified, the SR-22 WCC Project HOV direct connectors would become part of the I-405 tolled Express Lane Facility, and use of the direct connectors would become tolled.

Express Lane Transition Areas

Access points where Express Lanes begin or end would require transition areas. Transition areas near the beginning of Express Lanes would allow for traffic in HOV and GP lanes to change lanes to access the GP and Express Lanes within the project limits of Alternative 3 Modified. Transition areas at the end of Express Lanes would allow traffic in the Express and GP lanes to change lanes to access the GP and HOV lanes downstream of the end of the Express Facility. Transition Express Lanes would begin and end at four locations:

1. On SR-22 East at the I-405 interchange;
2. On I-605 at the I-405 interchange;
3. On I-405 at the Euclid Street interchange; and
4. On I-405 at the I-605 interchange.

Two transition areas (one in each direction) would be required for each location, for a total of 8 transition areas.

Express Lane Operations

The type of tolling to be used in the Express Lanes is likely to be either variable or dynamic. Variable tolling provides different toll amounts by hour of the day and day of the week. Variable tolling is currently used on the SR-91 Express Lanes, with toll amounts adjusted every few months based on traffic levels by hour of the day and day of the week during the previous few months. Dynamic tolling varies toll amounts minute to minute in response to the real-time volume of traffic in the Express Lanes and levels of congestion in the GP lanes.

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During peak hours of traffic congestion, the volume of traffic using the Express Lanes would be managed to maintain high speeds and minimize congestion in the Express Lanes. This would be accomplished by limiting the volume of traffic in the Express Lanes to a maximum of 1,700 vehicles per hour per lane (vphpl). Toll amounts would be adjusted up when the 1,700 vphpl target volume is exceeded to reduce the volume in the Express Lanes; conversely, toll amounts would be adjusted down when volumes fall below the target volume to attract more traffic into the Express Lanes.

The current plan is that the Express Lanes would use the same discount structure that is currently used on the SR-91 Express Lanes. HOVs with 3 or more occupants, zero omission vehicles, motorcycles, vehicles with disabled license plates, and disabled veterans would use the I-405 Express Lanes free of charge except during the most congested hours when such vehicles receive a 50 percent toll discount. The Express Lanes would be free to the following users at all times; transit vehicles, California Highway Patrol (CHP) vehicles, Caltrans vehicles, and emergency vehicles responding to an emergency.

All tolls on the I-405 Express Lanes would be collected electronically. All vehicles on the I-405 Express Lanes would be required to use a transponder, even when under a full toll discount.

Traffic volumes in the Express Lanes are based on congestion pricing limiting traffic in the lanes to a maximum of 1,700 vehicles per hour per lane as described in Section 1 of the Traffic Study. Volumes in the Express Lanes are expected to be slightly higher in the northern end of the corridor based on the Phase II Traffic & Revenue Study conducted for the corridor. The forecast volumes in the Express Lanes for Opening Year (2020) and Design Year (2040) are shown in Figures 1.1 and 1.2 along with volumes in the general purpose lanes.

Sections 1.1 through 1.5 below provide an analysis of the mainline freeway as well as the ramp junctions for Opening Year (2020) and Design Year (2040) conditions for Alternative 3 Modified. All analysis of arterial intersections with ramps and other arterials, as well as queuing analysis, is the same as for Alternative 3, except for the intersection analysis of Magnolia Street at the southbound I-405 ramps, which is presented in Section 1.6.

All LOS worksheets for mainline freeway segment and ramp junction locations north of Harbor Boulevard to Magnolia Street are provided in Appendix I. Under Alternative 3 Modified, mainline freeway segments and ramp junctions north of Magnolia Street are the same as under Alternative 3, except for the merge from the westbound SR-22 direct connector into the northbound Express Lanes. LOS worksheets for mainline freeway segment and ramp junction locations north of Magnolia Street can be found in the approved Traffic Study. The LOS worksheets for the merge into the northbound Express Lanes from the SR-22 westbound direct connector are presented in Appendix I Sections A3 and A4.

Mainline freeway segment and ramp junction locations from Harbor Boulevard south are the same as for Alternatives 1 and 2. The LOS worksheets for Harbor Boulevard and locations south of Harbor Boulevard for Alternative 2 are included in Appendix II for reference; they are identical to the appendix material for Alternative 2 in the approved Traffic Study.

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Section 1.6 describes and provides analysis of revisions to lane designations on southbound Magnolia Street at its intersection with the I-405 southbound ramps. Under Alternative 3 Modified the southbound approach would provide two exclusive through lanes and one exclusive right turn lane into the on-ramp to southbound I-405; under Alternative 3 there would be two exclusive through lanes and one shared through/right turn lane. The Synchro worksheets for this intersection under Alternative 3 Modified are provided in Appendix I B.

Section 1.7 describes and provides analysis of a design option for I-405 northbound between Warner Avenue and Magnolia Street using a C-D (collector-distributor) road design. The LOS worksheets for the C-D road design option are presented in Appendix I C.

1.1 Freeway Analysis and Levels of Service

In this section, Alternative 3 Modified is analyzed using projected Opening Year (2020) traffic volumes and Design Year (2040) traffic volumes. HCM methodology was used to analyze the LOS on freeway segments based on speed-flow-density relationships. The measure used to provide an estimate of LOS is density. A base free flow speed of 70 miles per hour was used to facilitate calculating the density and LOS for each freeway segment.

The Opening Year (2020) and Design Year (2040) AM and PM peak hour traffic volumes along with lane schematics for I-405 mainline and all interchange ramps within the project limits for Alternative 3 Modified are illustrated on Figures 1.1 and 1.2, respectively.

Tables 1.1 and 1.2 summarize the findings for Opening Year (2020) and Design Year (2040) northbound and southbound freeway conditions for Alternative 3 Modified. The peak hour capacity, demand volume, demand-to-capacity (d/c) ratio, density and LOS for all the freeway segments are shown. In general, under Alternative 3 Modified conditions, the freeway mainline general purpose lanes are expected to operate at LOS F in the AM and PM peak hours in both the southbound and northbound directions under 2020 and 2040 conditions. The express lanes are expected to operate generally at LOS C to D under 2020 and 2040 conditions.

1.2 Ramps and Ramp-Freeway Junction Analysis and Levels of Service

The density and LOS for each of the ramps along I-405 within the study area for Alternative 3 Modified are based on projected Opening Year (2020) traffic volumes and Design Year (2040) traffic volumes. Table 1.3 provides a summary of the findings from the analyses for Opening Year (2020) conditions. As discussed under Analysis Methodology (Section 2.1.2 of Final Traffic Study), for the Design Year (2040) conditions two separate analyses were conducted for ramps and ramp-freeway junctions: one for Unconstrained Mainline Volumes and another for Constrained Mainline Volumes.

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Tables 1.4 and 1.5 provide a summary of the findings from the analyses for Design Year (2040) conditions for the AM and PM time periods, respectively. The peak hour capacity, demand volume, demand-to-capacity (d/c) ratio, density and LOS for each of the freeway ramps are presented. Under Alternative 3 Modified conditions for 2020, the ramp junction peak hour LOS generally varies from B to F, with most ramps north of the Brookhurst Street/Talbert Avenue interchange operating at LOS C to E during both the AM and PM peak hours. For 2040, most ramp junctions operate at LOS F under the unconstrained analysis and LOS C to E under the constrained analysis.

The westbound SR-22 branch connector to northbound 405 Express Lanes merge location is expected to operate at LOS D during the AM and PM peak hours for both Opening Year (2020) and Design Year (2040). The design assumed for this merge would not result in removal of the College Park East sound wall and would provide a merging distance of 500 feet with three 12 ft lanes followed by a 600 ft taper to two 12 ft lanes.

1.3 Weaving Analysis

Weaving analysis is conducted between an on-ramp and an off-ramp spaced less than 2,500 feet apart. Separate analyses were conducted, as appropriate, for freeways and collector-distributor roads. Weaving analyses for Alternative 3 Modified are based on projected Opening Year (2020) traffic volumes and Design Year (2040) traffic volumes.

Table 1.6 summarizes the weaving analysis findings for Opening Year (2020) conditions for Alternative 3 Modified for both the freeway and the collector distributor roads. For the Design Year (2040) conditions, two separate analyses were conducted to evaluate freeway weaving conditions: one for Unconstrained Mainline Volumes, and another for Constrained Mainline Volumes.

Table 1.7 provides a summary of the findings from the freeway weaving analyses for Alternative 3 Modified for Design Year (2040) conditions. Table 1.8 summarizes the weaving analysis findings for Design Year (2040) conditions for Alternative 3 Modified for the collector-distributor roads; the density and LOS for all the weaving sections are shown. Most mainline freeway weaving segments and collector-distributor roads operate at LOS C to E under both 2020 and 2040 conditions.

1.4 Alternative 3 Modified Analysis Summary

Tables 1.1 and 1.2 document that LOS F is expected to occur in the general purpose lanes during the AM and PM peak hours on nearly all links in 2020 and on all links in 2040. The tables document that LOS C and D are expected in the express lanes.

Table 1.9 presents LOS and the percent increase in throughput of Alternative 3 Modified compared to the No Build alternative for three summary segments. Because the Express Lanes

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terminate at Euclid Street, the summary segments are slightly revised from those presented in the Traffic Study. The table shows that the general purpose lanes on all segments are expected to operate at LOS F during the peak hours. Due to the jammed LOS F conditions, throughput for the general purpose lanes is calculated based on 1200 v/h/ln, consistent with the methodology described in Section 2.1 of the Traffic Study. Since the express lanes will be managed to avoid operations under jammed conditions, throughput is determined based on 1700 v/h/ln, the volume to which the express lanes will be managed through the imposition of tolls.

Table 1.10 summarizes the speed index and d/c ratios for 2040 conditions under Alternative 3 Modified. The table shows that the d/c ratios in the general purpose lanes are expected to be in excess of 1.23 along the entire corridor. The d/c ratios in the express lanes are expected to range from 0.78 to 0.92. The speed index ranges from 6 to 42 in the general purpose lanes and 65 in the express lanes whose speeds and volumes are managed through the imposition of tolls.

1.5 Express Lane Transition and Access Areas

This section summarizes the LOS expected in the transition areas and intermediate access locations associated with the Express Lanes in Alternative 3 Modified.

Transition Areas

Transition areas are along the roadways at the beginning and end of the Express Lanes and allow traffic in HOV and GP lanes to change lanes, if necessary, to access the GP and Express Lanes or vice versa. Transition areas may add new lanes and/or redesignate lanes from HOV to Express. The four proposed transition areas are listed above.

Limits of transition areas approaching the start of the Express Lanes are defined upstream by the termination of an HOV restriction and downstream by the solid striping used to delineate the separation between the Express Lanes and the general purpose lanes. Limits of the transition areas approaching the end of the Express Lanes are defined upstream by the termination of solid striping used to delineate the separation between the Express Lanes and the general purpose lanes and the beginning of the downstream HOV access restriction.

The length of the transition areas ranges from 2,600 feet to 12,150 feet. Due to the length of these areas, they are analyzed using the HCM freeway segment analysis. (Weaving analysis is not appropriate for these transition areas because the HCM weaving analysis method is limited "to weaving segments up to 2,500 ft long." (HCM 2000 p 13-18))

Tables 1.11 and 1.12 summarize the LOS in each of the transition areas anticipated for Opening Year (2020) and Design Year (2040), respectively. The transition areas are anticipated to operate at a level similar to the level expected for the HOV and/or general purpose lanes in the vicinity of the transition area. The northbound transition area on I-405 from Harbor Blvd to Euclid St is shown in **Table 1.12** to operate at LOS F in 2040; **Table 1.2** shows that the segment of I-405 northbound from Harbor Blvd to Euclid is expected to operate at LOS F in both the HOV and general purpose lanes. In the southbound direction both the transition area and the adjacent HOV and GP lanes are also expected to operate at LOS F in 2040.

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The northbound transition area on I-405 from I-605 to the end of the HOV access is shown in **Table 1.12** to operate at LOS F in 2040; **Table 1.2** shows that this segment of I-405 northbound is expected to operate at LOS F in both the HOV and general purpose lanes. In the southbound direction both the transition area and the segment HOV and GP lanes are also expected to operate at LOS F in 2040.

The westbound transition area on SR-22 from the end of the HOV restriction to Valley View Street is shown in **Table 1.12** to operate at LOS F in 2040; **Table 1.4** shows that the branch connector from SR-22 westbound to northbound I-405 is expected to operate with a V/C ratio of 1.56 (LOS F) in 2040 under Alternative 3 Modified. The Express Lane direct connector is forecast to have a volume of 700 per hour (see **Figure 1.2**) with a V/C ratio of 0.47 based on a capacity of 1,500. Under the No Build Alternative the volume on the HOV direct connector from SR-22 westbound to northbound I-405 is forecast to be 1,739 and 2,030 during the AM and PM peak hours, respectively, (see **Figure 2.4.2** of the Traffic Study) both well in excess of the capacity of a single lane HOV direct connector of 1,500. Under the No Build Alternative the general purpose branch connector from SR-22 westbound to northbound I-405 is forecast to operate with a V/C ratio of 1.33 in 2040 (see **Table 2.4.4** of the Traffic Study). In short westbound SR-22 approaching I-405 northbound is expected to operate at LOS F under all conditions, except that the Express Lane direct connector itself would operate below capacity under Alternative 3 Modified.

The eastbound transition area on SR-22 is shown in **Table 1.12** to operate at LOS F in 2040; **Table 1.4** shows that branch connector from I-405 southbound to eastbound SR-22 is expected to operate with a V/C ratio of 1.40 (LOS F) in 2040 under Alternative 3 Modified. The Express Lane direct connector is forecast to have a volume of 700 per hour (see **Figure 2.7.2** of the Traffic Study) with a V/C ratio of 0.47 based on a capacity of 1,500. Under the No Build Alternative the volume on the HOV direct connector from I-405 southbound to eastbound SR-22 is forecast to be 1,644 and 1,819 during the AM and PM peak hours, respectively, (see **Figure 2.4.2** of the Traffic Study) both well in excess of the capacity of a single lane HOV direct connector of 1,500. Under the No Build Alternative the general purpose branch connector from I-405 southbound to eastbound SR-22 is forecast to operate with a V/C ratio of 0.97 in 2040 (see **Table 2.4.4** of the Traffic Study). Under the No Build Alternative, the combined volume of the HOV and general purpose connectors will result in an over capacity condition on SR-22 eastbound downstream of the direct connector. In short the HOV direct connector to eastbound SR-22 is expected to operate with a V/C ratio in excess of 1.00 under the No Build condition and under 1.00 with the Express Lanes in Alternative 3 Modified and the transition area along eastbound SR-22 is anticipated to operate at LOS F under all conditions.

The northbound transition area on I-605 from the termination of the direct connector separation to the end of the HOV access is shown in **Table 1.12** to operate at LOS D and F during the AM and PM peak hours, respectively, in 2040; **Table 1.2** shows that this segment of I-605 northbound is expected to operate at LOS C and F in both the HOV and general purpose lanes during the AM and PM peak hours, respectively, in 2040. In the southbound direction the transition area is expected to operate at LOS F and C during the AM and PM peak hours, respectively; the segment HOV lanes are expected to operate at LOS E and D during the AM and

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PM peak hours, respectively, while the GP lanes are expected to operate at LOS F and D during the AM and PM peak hours, respectively.

Generally, the transition areas are anticipated to operate at a level similar to the level expected for the HOV and/or general purpose lanes in the vicinity of the transition area. In only one case is the 2040 HOV lane LOS better than the transition area LOS: I-605 during the AM peak hour where the northbound LOS in the HOV lane is C compared to D in the transition area and the southbound where the LOS in the HOV lane is E compared to F in the transition area. Overall, the transition areas are not expected to degrade operations of the HOV system adjacent to the transition areas.

Intermediate Access Areas

The two intermediate at-grade access locations are near the Magnolia/Warner interchange and the Bolsa/Goldenwest interchange. The design of the Magnolia/Warner intermediate access area is a skip stripe similar to the existing access locations to HOV lanes on I-405. The length of the skip stripe area is 2,000 feet. The design of the Bolsa/Goldenwest access area includes a "weaving" lane between the #2 Express Lane and the #1 general purpose lane; the "weaving" lane is 2,100 feet in length. These proposed designs are consistent with the Caltrans Traffic Operations Policy Directive (TOPD) 11-02.

The following qualitative analysis is presented for the year 2040 operations anticipated in the two intermediate access areas. HCM weaving analysis is not used to evaluate operations for either intermediate access location because the LOS F conditions expected in the general purpose lanes (see Table 1.2) make such an HCM analysis unreliable. The HCM weaving method effectively averages the densities of the two incoming roadways, represented by LOS C in the Express Lanes and LOS F in the general purpose lanes, resulting in a determination of LOS D or E in the weaving section. Such a result does not reliably relate the expected operations in the intermediate access area.

The LOS F conditions expected during peak hours in the general purpose lanes at the Magnolia/Warner intermediate access area will affect vehicles exiting the Express Lanes. Slower speeds are expected in the #2 Express Lane as motorists exiting the Express Lanes match the slower speed of the general purpose lanes before making the lane change to the #1 general purpose lane. Slower speeds are also expected in the #2 Express Lane as motorists entering the Express Lanes move out of the LOS F conditions in the #1 general purpose lane into the #2 Express Lane. This condition is similar to the condition experienced in the existing limited access HOV lanes along I-405 during periods of congestion in the adjacent general purpose lanes. Experience over the last 20 years has shown that these HOV access locations operate efficiently and safely. Motorists adjust speeds as necessary to complete the required lane changes between the higher speed HOV lane and the lower speed general purpose lane. Some deterioration in LOS is anticipated in the Express Lanes in the vicinity of the Magnolia/Warner intermediate access area.

The LOS F conditions expected in the general purpose lanes at the Bolsa/Goldenwest intermediate access area are not expected to affect vehicles exiting or entering the Express Lanes. A weaving lane is provided between the #2 Express Lane and the #1 general purpose lane

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to accommodate adjustments in speed between those lanes. The weaving lane provides the necessary length (per Caltrans TOPD 11-02) to accommodate motorists entering and exiting the Express Lanes as they adjust their speed between the higher speed #2 Express Lane and the lower speed #1 general purpose lane.

A third intermediate access area is located at the SR-22 East. The direct connector from the median of SR-22 East to the median of I-405 being constructed as part of the WCC project would become part of the Express Facility and would be tolled. The transition areas on SR-22 are covered above. The merge of the single lane direct connector from SR-22 westbound into the northbound Express Lanes on I-405 is forecast to operate at LOS D during both the AM and PM peak hours in years 2020 and 2040 as noted above in Section 1.2. The volumes using the direct connector and the Express Lanes would be managed to maintain the same volumes on those facilities in both directions in years 2020 and 2040, as shown in Figures 2.7.1 and 2.7.2. The diverge of the single lane direct connector to SR-22 eastbound from the southbound Express Lanes on I-405 is forecast to operate at LOS C during both the AM and PM peak hours in years 2020 and 2040.

1.6 I-405 Southbound Ramps/Magnolia Street Intersection Analysis

Under Alternative 3 Modified, the Project Condition lane configuration at the intersection of the I-405 Southbound Ramps and Magnolia Street would be three exclusive northbound through lanes, two exclusive southbound through lanes, one exclusive southbound right turn lane, dual left turn lanes eastbound and dual right turn lanes eastbound. The intersection would be signalized. LOS was conducted for the I-405 southbound ramp and Magnolia Street intersection for Year 2020 and 2040 Project Conditions. Analysis was conducted for Project traffic with the proposed improvements. Table 1.13 shows the resulting LOS at the intersection with the minor lane designation change. As shown in Table 1.13 the I-405 southbound ramp and Magnolia Street intersection is expected to operate at LOS A and B during both peak hours under Year 2020 and Year 2040 conditions. The resulting peak hour queues under Year 2020 and 2040 indicate that the storage being provided under the Project Condition will be sufficient.

For comparison purposes, Table 1.13 also summarizes LOS, v/c ratios and average delays under No Build Condition and Project traffic under No Build lane geometrics. LOS worksheets for these two conditions can be found in the Traffic Study.

As shown in Table 1.13, the widening of Magnolia Street and the improvement of the I-405 Southbound Off-Ramp under the Project Condition allows the I-405 Southbound Off-Ramp/Magnolia Street intersection to operate at LOS B or better compared to LOS F under Year 2040 No Build Condition. The intersection does not meet the significant impact criteria and there are no significant traffic impacts at the intersection.

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1.7 Design Option for I-405 Northbound Between Warner Avenue and Magnolia Street

The following is the traffic analysis for the proposed design option on northbound I-405 between Warner Avenue and Magnolia Street. For the design option, weaving and freeway-ramp junction analyses were conducted.

Ramp Junction Analysis

The ramp junction analysis is conducted for the following locations:

- Northbound I-405 Loop Off-Ramp to Warner Avenue
- Northbound I-405 Off-Ramp to Collector-Distributor (C-D) Road (between Warner Ave and Magnolia St)

The density and LOS for each of the ramps listed above are based on projected Opening Year (2020) traffic volumes and Design Year (2040) traffic volumes. Table 1.14 provides a summary of the findings from the analyses for Opening Year (2020) conditions. Tables 1.15 and 1.16 provide a summary of the findings from the analyses for Design Year (2040) conditions for the AM and PM time periods, respectively. The peak hour capacity, demand volume, demand-to-capacity (d/c) ratio, density and LOS for each of the freeway ramps are presented.

Under the proposed design option for 2020 Alternative 3 Modified, the ramp junction peak hour LOS generally varies from D to F during both the AM and PM peak hours. For 2040, the ramps operate at LOS E and F under the unconstrained analysis and LOS D and E under the constrained analysis.

Weaving Analysis: C-D Road

Weaving analysis was conducted for the northbound C-D road between the loop on-ramp from Warner Avenue and the direct off-ramp to Magnolia Street. Weaving analyses are based on projected Opening Year (2020) traffic volumes and Design Year (2040) traffic volumes.

Tables 1.17 and 1.18 summarize the weaving analysis findings for Opening Year (2020) and Design Year (2040) conditions for the proposed design option. Under 2020 conditions, the weaving segment is expected to operate at LOS B and D during the AM and PM peak hours. For 2040, the weaving segment is expected to operate at LOS B and D during the AM and PM peak hours.

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Table 1.1: Alternative 3 Modified (2020) I-405 Mainline Peak Hour Level of Service

Location	Lane Type	Direction	Mainline		Alternative 3 Modified Condition (2020)							
					AM Peak Hour			PM Peak Hour				
			Lanes	Capacity ^{1,4}	Traffic Demand Volume ⁵	d/c	Density ⁶	LOS ⁷	Traffic Demand Volume ⁵	d/c	Density ⁶	LOS ⁷
Bristol Street to Fairview Road	GP	NB	5	9,250	9,734	1.05	33.2	F	10,322	1.12	37.0	F
		SB	5	9,250	12,450	1.35	-	F	9,943	1.07	34.4	F
	HOV	NB	1	1,850	1,947	1.05	33.2	F	2,064	1.12	37.0	F
		SB	1	1,850	2,468	1.35	-	F	1,989	1.08	34.4	F
Fairview Road to Harbor Boulevard/Hyland Avenue	GP	NB	6	11,100	11,023	0.99	30.2	D	12,153	1.09	35.6	F
		SB	7	12,950	16,775	1.30	-	F	13,430	1.04	32.4	F
	HOV	NB	1	1,850	1,837	0.99	30.2	D	2,026	1.10	35.6	F
		SB	1	1,850	2,397	1.30	-	F	1,919	1.04	32.4	F
Harbor Boulevard/Hyland Avenue to Euclid Street/Ellis Avenue	GP	NB	6	11,100	11,027	1.07	34.4	F	13,470	1.21	-	F
		SB	6	11,100	15,486	1.40	-	F	12,596	1.13	38.3	F
	HOV	NB	1	1,850	1,988	1.07	34.4	F	2,245	1.21	-	F
		SB	1	1,850	2,581	1.40	-	F	2,099	1.13	38.3	F
Euclid Street/Ellis Avenue to Brookhurst Street/Taibet Avenue	GP	NB	6	11,100	11,015	0.88	25.5	C	12,515	1.00	30.5	D
		SB	5	9,250	13,766	1.43	-	F	10,224	1.11	36.3	E
	Express	NB	2	3,700	2,900	0.78	22.3	C	3,200	0.86	24.6	C
		SB	2	3,700	3,200	0.86	24.6	C	2,800	0.78	22.3	C
Brookhurst Street/Taibet Avenue to Magnolia Street/Warner Avenue	GP	NB	5	9,250	9,625	1.04	32.5	F	10,909	1.18	41.9	F
		SB	5	9,250	11,654	1.26	-	F	9,707	1.05	33.0	F
	Express	NB	2	3,700	2,900	0.78	22.3	C	3,200	0.86	24.6	C
		SB	2	3,700	3,200	0.86	24.6	C	2,800	0.78	22.3	C
Magnolia Street/Warner Avenue to Beach Boulevard/Edinger Street	GP	NB	5	9,250	10,378	1.12	37.4	F	11,079	1.20	43.6	F
		SB	5	9,250	10,480	1.13	38.2	F	10,277	1.11	36.7	F
	Express	NB	2	3,700	2,800	0.75	21.5	C	3,000	0.81	23.1	C
		SB	2	3,700	3,000	0.81	23.1	C	2,850	0.80	22.7	C

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Table 1.1: Alternative 3 Modified (2020) I-405 Mainline Peak Hour Level of Service

Location	Lane Type	Direction	Mainline		Alternative 3 Modified Condition (2020)				
			Lanes	Capacity ^{2,3}	AM Peak Hour		PM Peak Hour		
					Traffic Demand Volume ⁴	d/c	Density ²	LOS ³	LOS ³
Beach Boulevard/Eldinger Street to Goldenwest Street/Bolsa Avenue	GP	NB	5	9,250	9,900	1.07	34.2	F	38.1
		SB	5	9,250	9,692	1.05	32.9	F	35.5
	Express	NB	2	3,700	2,600	0.76	21.5	C	25.1
		SB	2	3,700	3,600	0.81	23.1	C	22.7
Goldenwest Street/Bolsa Avenue to Springdale Street/Westminster Boulevard	GP	NB	5	9,250	9,950	1.08	34.5	F	41.6
		SB	5	9,250	10,350	1.10	35.7	F	45.4
	Express	NB	2	3,700	2,700	0.73	20.8	C	20.8
		SB	2	3,700	2,700	0.73	20.8	C	20.8
Springdale Street/Westminster Boulevard to Bolsa Chica Road/Valley View Street	GP	NB	5	9,250	10,718	1.10	36.0	F	43.4
		SB	5	9,250	9,598	1.08	34.8	F	39.5
	Express	NB	2	3,700	2,700	0.73	20.8	C	20.8
		SB	2	3,700	2,700	0.73	20.8	C	20.8
Bolsa Chica Road/Valley View Street to Seal Beach Boulevard	GP	NB	7	12,950	15,341	1.18	42.3	F	42.2
		SB	7	12,950	15,479	1.20	43.3	F	41.2
	Express	NB	2	3,700	3,400	0.92	26.2	D	26.2
		SB	2	3,700	3,400	0.92	26.2	D	26.2
Seal Beach Boulevard to I-405	GP	NB	7	12,950	15,391	1.19	42.7	F	41.6
		SB	7	12,950	15,484	1.20	43.4	F	41.6
	Express	NB	2	3,700	3,400	0.92	26.2	D	26.2
		SB	2	3,700	3,400	0.92	26.2	D	26.2
I-405 to San Gabriel River	GP	NB	4	7,400	9,518	1.20	43.3	F	34.5
		SB	4	7,400	8,500	1.17	41.7	F	44.4
	HOV	NB	1	1,850	2,279	1.29	*	F	34.5
		SB	1	1,850	2,162	1.17	41.7	F	44.4

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I-405 Improvement Project Supplemental Traffic Study

Alternative 3 Modified

Table 1.1: Alternative 3 Modified (2020) I-405 Mainline Peak Hour Level of Service

Location	Lane Type	Direction	Mainline		Alternative 3 Modified Condition (2020)				
			Lanes	Capacity ^{2,3}	AM Peak Hour		PM Peak Hour		
					Traffic Demand Volume ⁴	d/c	Density ²	LOS ³	LOS ³
I-605 — I-405 to Express/HOV Transition	GP	NB	5	9,250	6,406	0.69	19.9	C	C
		SB	4	7,400	6,795	0.92	27.6	D	22.4
	Express/HOV	NB	1	1,850	1,550	0.84	39.9	C	25.0
		SB	1	1,850	1,500	0.81	27.6	D	22.4
I-605 — Express/HOV Transition to Katella Avenue	GP	NB	4	7,400	6,365	0.86	19.8	C	24.2
		SB	4	7,400	6,845	0.93	28.1	D	23.3
	HOV	NB	1	1,850	1,551	0.86	19.8	C	24.2
		SB	1	1,850	1,410	0.76	28.1	D	23.3

- Notes:
1. Peak hour capacity and traffic volumes are shown in vehicles per hour (vph).
 2. Density is shown in passenger cars/mile/hour (pc/mi/hr).
 3. Level of Service (LOS): General Purpose (GP) lane, High Occupancy Vehicle (HOV) lane and Express Toll Lane (ETL) based on density except when demand-to-capacity (d/c) ratio is greater than or equal to 1.0, which is LOS F.
 4. Peak hour capacities for freeway lanes include 1,850 vph for each GP lane and a single HOV/Express lane and 3,700 vph for dual HOV/Express lanes.
 5. * Density is in excess of 45 pc/mi/hr; therefore LOS is F.

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GL-9 (Continued)

GL-9 (Continued)

I-405 Improvement Project Supplemental Traffic Study Alternative 3 Modified

Table 1.2: Alternative 3 Modified (2040) I-405 Mainline Peak Hour Level of Service

Location	Lane Type	Direction	Mainline		Alternative 3 Modified Condition (2040)				
			Lanes	Capacity ^{1,2}	Traffic Demand Volume	d/c	Density	LOS ³	PM Peak Hour
Bristol Street to Fairview Road	GP	NB	5	9,250	11,079	1.20	43.8	F	11,067
		SB	5	9,250	14,302	1.55	44.2	F	11,139
		HOV	1	1,850	2,215	1.20	43.6	F	2,213
Fairview Road to Harbor Boulevard/Hyland Avenue	GP	NB	6	11,200	12,545	1.13	38.0	F	12,228
		SB	7	12,950	19,451	1.50	40.6	F	14,239
		HOV	1	1,850	2,091	1.13	38.0	F	15,085
Harbor Boulevard/Hyland Avenue to Euclid Street/Ellis Avenue	GP	NB	6	11,100	13,635	1.23	40.6	F	15,597
		SB	6	11,100	16,059	1.63	41.1	F	14,196
		HOV	1	1,850	2,273	1.23	41.1	F	2,600
Euclid Street/Ellis Avenue to Brookhurst Street/Talbert Avenue	GP	NB	6	11,100	11,647	1.05	33.0	F	13,316
		SB	5	9,250	15,955	1.72	43.8	F	11,858
		Express	2	3,700	2,900	0.78	22.3	C	3,100
Brookhurst Street/Talbert Avenue to Magnolia Street/Warner Avenue	GP	NB	5	9,250	11,616	1.26	40.6	F	13,271
		SB	5	9,250	14,177	1.54	41.1	F	11,313
		Express	2	3,700	2,900	0.78	22.3	C	3,200
Magnolia Street/Warner Avenue to Beach Boulevard/Fidinger Street	GP	NB	5	9,250	12,004	1.34	40.6	F	13,149
		SB	5	9,250	13,119	1.43	41.1	F	11,808
		Express	2	3,700	2,900	0.76	21.5	C	3,000

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I-405 Improvement Project Supplemental Traffic Study

Alternative 3 Modified

Table 1.2: Alternative 3 Modified (2040) I-405 Mainline Peak Hour Level of Service

Location	Lane Type	Direction	Mainline		Alternative 3 Modified Condition (2040)				
			Lanes	Capacity ^{1,2}	Traffic Demand Volume	d/c	Density	LOS ³	PM Peak Hour
Beach Boulevard/Fidinger Street to Goldenwest Street/Bolsa Avenue	Express	NB	5	9,250	11,928	1.29	43.8	F	12,423
		SB	5	9,250	12,567	1.35	43.8	F	11,768
		Express	2	3,700	2,800	0.76	21.5	C	3,000
Goldenwest Street/Bolsa Avenue to Springdale Street/Weiminster Boulevard	GP	NB	5	9,250	11,959	1.30	43.8	F	12,568
		SB	5	9,250	12,929	1.40	43.8	F	11,751
		Express	2	3,700	2,700	0.73	20.8	C	2,700
Springdale Street/Weiminster Boulevard to Bolsa Chico Road/Valley View Street	GP	NB	5	9,250	12,218	1.32	43.8	F	12,817
		SB	5	9,250	12,793	1.38	43.8	F	11,035
		Express	2	3,700	2,700	0.73	20.8	C	2,700
Bolsa Chico Road/Valley View Street to Seal Beach Boulevard	GP	NB	7	12,950	18,304	1.41	43.8	F	18,505
		SB	7	12,950	19,259	1.49	43.8	F	17,667
		Express	2	3,700	3,400	0.92	26.2	D	3,400
Seal Beach Boulevard to I-605	GP	NB	7	12,950	18,316	1.42	43.8	F	18,508
		SB	7	12,950	19,298	1.49	43.8	F	17,440
		Express	2	3,700	3,400	0.92	26.2	D	3,400
I-605 to San Gabriel River	GP	NB	4	7,400	11,076	1.50	43.8	F	8,814
		SB	4	7,400	10,563	1.43	43.8	F	10,420
		HOV	1	1,850	2,269	1.50	43.8	F	2,228

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Improvement Project: Supplemental Traffic Study Alternative Modified

Table 1.2: Alternative 3 Modified (2040) I-405 Mainline Peak Hour Level of Service

Location	Lane Type	Direction	Mainline		Alternative 3 Modified Condition (2040)							
			Lanes	Capacity ^{2,5}	AM Peak Hour			PM Peak Hour				
					Traffic Demand Volume ³	d/c	Density ⁴	LOS ⁵	Traffic Demand Volume ³	d/c	Density ⁴	LOS ⁵
I-605 — I-405 to Express/HOV Transition	GP	NB	5	9,250	7,597	0.80	23.1	C	9,441	1.06	33.8	F
		SB	4	7,400	8,162	1.10	35.7	F	6,811	0.92	27.7	D
	Express/HOV	NB	1	1,850	1,650	0.89	23.1	C	1,800	0.97	35.8	D
		SB	1	1,850	1,600	0.86	36.7	E	1,400	0.76	27.7	D
I-605 — Express/HOV Transition to Katella Avenue	GP	NB	4	7,400	7,238	0.98	21.5	C	9,313	1.26	30.9	F
		SB	4	7,400	8,103	1.10	35.2	F	6,815	0.92	27.7	D
	HOV	NB	1	1,850	1,609	0.98	22.5	C	2,328	1.26	30.9	F
		SB	1	1,850	1,653	0.90	36.2	E	1,396	0.76	27.7	D

- Notes:
1. Peak hour capacity and traffic volumes are shown in vehicles per hour (vph).
 2. Density is shown in passenger cars/mile/lane (pc/mi/ln).
 3. Level of Service (LOS): General Purpose (GP) lane, High Occupancy Vehicle (HOV) lane and Express Toll lanes LOS is based on density except when demand-to-capacity (d/c) ratio is greater than or equal to 1.0, which is LOS F.
 4. Peak hour capacities for freeway lanes include 1,850 vph for each GP lane and a single HOV/Express lane and 3,700 vph for dual HOV/Express lanes.
 5. * Density is in excess of 45 pc/mi/ln, therefore LOS is F.

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I-405 Improvement Project Supplemental Traffic Study

Alternative 3 Modified

Table 1.3: Alternative 3 Modified (2020) I-405 Ramp Junction Peak Hour Level of Service

Interchange	Ramp Type	Ramp Lanes	Ramp Capacity ^{1,2}	Alternative 3 Modified Condition (2020)					
				AM Peak		Ramp		PM Peak	
				Traffic Volume ¹	Density ²	LOS ^{1,5}	Traffic Volume ¹	d/c	Density ² : LOS ^{1,5}
Brisco Street	NB On Loop	1	1,500	148	0.10	31.0	335	0.22	33.0 : D
	NB On Direct	1	1,500	349	0.23	22.7	238	0.16	24.5 : C
	SB Off Direct	2	3,000	1,295	0.43	—	995	0.31	20.2 : C
	SB On Loop	1	1,500	1,042	0.69	—	1,418	0.95	28.1 : D
Fairview Road	NB Off Direct	2	3,000	2,975	0.99	—	3,512	1.17	— : F
	NB On Direct	1	1,500	743	0.50	22.0	707	0.47	24.3 : C
	SB Off Direct	2	3,000	788	0.26	—	844	0.28	22.5 : C
	SB On Direct	1	1,500	1,371	0.91	—	1,043	0.70	23.4 : C
Harbor Boulevard	NB On Loop	1	1,500	502	0.33	30.1	603	0.40	33.5 : D
	NB On Direct	1	1,500	553	0.37	24.9	933	0.62	— : F
	SB Off Direct	2	3,000	1,202	0.40	—	1,132	0.38	15.4 : B
	SB On Loop	1	1,500	968	0.65	—	1,039	0.69	23.1 : C
Euclid Street & Ellis Avenue	SB On Direct	1	1,500	1,339	0.89	—	747	0.50	24.5 : C
	NB Off Loop	2	3,000	1,573	0.52	15.9	2,057	0.70	21.8 : C
	NB On Direct	1	1,500	275	0.18	20.8	658	0.45	23.5 : C
	SB Off Direct	1	1,500	474	0.32	—	429	0.29	25.6 : C
Brookhurst Street & Tabert Avenue	SB On Loop	1	1,500	949	0.63	—	1,230	0.82	28.3 : D
	SB On Direct	1	1,500	1,116	0.75	—	770	0.51	24.7 : C
	NB Off Direct	2	3,000	1,204	0.40	—	1,395	0.47	— : B
	NB On Loop	1	1,500	775	0.52	26.0	861	0.57	29.3 : D
	NB On Direct	1	1,500	339	0.23	23.3	357	0.24	26.8 : C
	SB Off Direct	1	1,500	820	0.55	—	950	0.63	38.8 : E
	SB On Loop	1	1,500	1,325	0.88	—	723	0.48	27.2 : C
	SB On Direct	1	1,500	—	—	—	—	—	— : —

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GL-9 (Continued)

GL-9 (Continued)

Improvement Project Supplemental Traffic Study Alternative 3 Modified

Table 1.3: Alternative 3 Modified (2020) I-405 Ramp Junction Peak Hour Level of Service

Interchange	Ramp Type	Ramp Lanes	Ramp Capacity	Alternative 3 Modified Condition (2020)			
				AM Peak		PM Peak	
				Traffic Volume ¹	d/c	Traffic Volume ²	Density ³ LOS ^{4,5}
Magnolia Street & Warner Avenue	NB Off Loop	1	1,500	505	0.34	781	0.52 F
	NB Off Direct	1	1,500	236	0.16	33.2	0.45 D
	NB On Direct (Warner)	1	1,500	534	0.36	856	0.37 C
	NB On Loop + Direct (Magnolia)	1	1,500	880	0.57	548	0.38 C
	SB Off Direct	1	1,500	554	0.37	1,141	0.76 F
Branch Boulevard & Edinger Avenue	SB On Direct	1	1,500	1,331	0.93	732	0.49 C
	NB Off Direct	2	3,000	1,595	0.53	1,839	0.63 B
	NB On Loop	1	1,500	828	0.55	1,022	0.67 D
	NB On Direct	1	1,500	289	0.19	277	0.18 D
	SB On Loop	2	3,000	968	0.32	1,508	0.60 C
Goldenwest Street & Bolsa Avenue	SB On Loop	1	1,500	758	0.51	897	0.60 C
	SB On Direct	1	1,500	958	0.67	780	0.52 C
	NB Off Loop	1	1,500	866	0.58	769	0.51 C
	NB On Loop	1	1,500	826	0.55	885	0.59 D
	SB Off (Direct + Loop)	1	1,500	1,041	0.69	943	0.63 C
Springdale Street & Westminster Boulevard	SB Off (Direct + Loop)	1	1,500	503	0.50	1,211	0.81 C
	NB Off Loop	1	1,500	752	0.50	931	0.62 F
	NB On Direct	1	1,500	970	0.65	909	0.61 C
	SB Off Direct	1	1,500	967	0.64	435	0.39 C
	SB Off Loop	1	1,500	263	0.18	235	0.16 D
	SB On Direct	1	1,500	768	0.51	968	0.65 C

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I-405 Improvement Project Supplemental Traffic Study

Alternative 3 Modified

Table 1.3: Alternative 3 Modified (2020) I-405 Ramp Junction Peak Hour Level of Service

Interchange	Ramp Type	Ramp Lanes	Ramp Capacity	Alternative 3 Modified Condition (2020)			
				AM Peak		PM Peak	
				Traffic Volume ¹	d/c	Traffic Volume ²	Density ³ LOS ^{4,5}
Sidex Chica Road & Garden Grove Boulevard	NB Off Direct	1	1,500	901	0.60	1,252	0.83 F
	SB Off Direct	2	3,000	1,204	0.40	1,024	0.34 B
	SB On Loop	1	1,500	944	0.63	1,145	0.76 C
	NB Off Direct	1	1,500	769	0.51	1,036	0.73 F
Seal Beach Boulevard	NB On Loop	1	1,500	829	0.55	1,013	0.68 F
	SB Off Loop	2	3,000	944	0.31	1,191	0.40 B
	SB On Direct	1	1,500	939	0.63	1,119	0.75 C
	NB On From WB SR-22	1	1,500	700	0.47	700	0.47 D
I-405 Express & SR-22	Freeway-to-Freeway Branch Connectors ⁶						
	NB On From NB SR-73	3	5,400	3,411	0.63	4,598	0.85 F
	NB On From WB SR-22 ⁷	2.5	4,500	6,064	1.35	5,706	1.27 F
	NB Off to WB SR-22	2	3,600	2,665	0.74	2,937	0.62 C
	NB Off to NB I-605	2	3,600	2,729	0.76	4,333	1.20 F
	SB On From SB I-605	2	3,600	3,890	1.08	3,030	0.84 F
I-405 Freeway Interchanges with SR-73, SR-22 & I-605	SB On From EB SR-22	2	3,600	2,662	0.75	3,077	0.84 F
	SB Off to EB SR-22	3	5,400	5,221	0.97	5,404	1.02 F
	SB Off to SB SR-73	3	5,400	4,767	0.88	3,616	0.67 C

- Notes:
1. Peak hour capacity and traffic demand forecast volumes are shown in vehicles per hour (vph).
 2. Density is shown in passenger cars/mile/hour (pc/mph).
 3. Level of Service (LOS) is based on density (pc/mph); d/c - demand-to-capacity ratio.
 4. Peak hour capacities for freeway ramps include 1,500 vph for each freeway ramp lane and 3,000 vph for each freeway-to-freeway branch connector lane.
 5. LOS is as the total flow of the merge/diverge area exceeds the capacity of the freeway segment, the density is not applicable in this case.
 6. * Per Highway Capacity Manual, at the impact area of merge and diverge is primarily focused on an influence area of 1,500 ft, the density was not calculated for areas exceeding 1,500 ft in length.
 7. As the 3 lanes on WB SR-22 are reduced to 2 lanes at I-405 connection, 2.5 lanes are assumed for increased capacity due to forced flow condition.
 8. For freeway-to-freeway branch connectors, d/c ratios are provided.

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GL-9 (Continued)

GL-9 (Continued)

Improvement Project Supplemental Traffic Study Alternative 3 Modified

Table 1.4: Alternative 3 Modified (2040) I-405 Ramp Junction Peak Hour Level of Service - AM

Interchange	Ramp Type	Ramp Lanes	Ramp Capacity	Peak Condition				Non-Peak Condition			
				(Unconstrained Mainline Volume)				(Constrained Mainline Volume)			
				Traffic Volume ¹	d/c	Density ²	LOS ³	Traffic Volume ¹	d/c	Density ²	LOS ³
Berntol Street	NB On Loop	1	1,500	152	0.10	36.3	E	132	0.10	30.7	D
	NB On Direct	1	1,500	379	0.25	26.0	C	379	0.25	22.2	C
	SB Off Direct	2	3,000	1,347	0.45	--	F	1,347	0.45	21.7	C
	SB On Loop	1	1,500	1,084	0.72	--	F	1,084	0.72	28.3	D
Fairview Road	NB Off Direct	2	3,000	3,107	1.04	--	F	3,107	1.04	30.3	F
	NB On Direct	1	1,500	794	0.53	24.9	C	794	0.53	23.4	C
	SB Off Direct	2	3,000	820	0.27	--	F	820	0.27	21.7	C
	SB On Direct	1	1,500	1,444	0.36	--	F	1,444	0.36	23.8	C
Harbor Boulevard	NB On Loop	1	1,500	522	0.35	34.7	D	522	0.35	30.4	D
	NB On Direct	1	1,500	750	0.50	--	F	750	0.50	24.2	C
	SB Off Direct	2	3,000	1,251	0.42	--	F	1,251	0.42	13.8	B
	SB On Loop	1	1,500	1,007	0.57	--	F	1,007	0.57	22.3	B
Euclid Street & Ellis Avenue	NB On Direct	1	1,500	1,383	0.88	--	F	1,383	0.88	24.9	C
	NB Off Loop	2	3,000	1,679	0.55	19.8	B	1,679	0.55	16.7	B
	SB Off Direct	1	1,500	318	0.21	25.7	C	318	0.21	25.1	C
	SB On Direct	1	1,500	639	0.43	--	F	639	0.43	23.5	C
Brookhurst Street & Talbert Avenue	NB On Direct	1	1,500	1,479	0.59	--	F	1,479	0.59	23.3	C
	SB On Loop	1	1,500	1,086	0.72	--	F	1,086	0.72	26.7	D
	NB Off Direct	2	3,000	1,329	0.44	--	B	1,329	0.44	--	B
	NB On Loop	2	3,000	867	0.58	31.1	D	867	0.58	28.1	D
Brookhurst Street & Talbert Avenue	NB On Direct	1	1,500	431	0.29	--	F	431	0.29	23.2	C
	SB Off Direct	1	1,500	853	0.57	--	F	853	0.57	36.8	E
	SB On Loop	1	1,500	1,379	0.82	--	F	1,379	0.82	28.8	D
	SB On Direct	1	1,500	--	--	--	--	--	--	--	--

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Improvement Project Supplemental Traffic Study

Alternative 3 Modified

Table 1.4: Alternative 3 Modified (2040) I-405 Ramp Junction Peak Hour Level of Service - AM

Interchange	Ramp Type	Ramp Lanes	Ramp Capacity	Peak Condition				Non-Peak Condition			
				(Unconstrained Mainline Volume)				(Constrained Mainline Volume)			
				Traffic Volume ¹	d/c	Density ²	LOS ³	Traffic Volume ¹	d/c	Density ²	LOS ³
Magnolia Street & Warner Avenue	NB Off Loop	1	1,500	520	0.35	--	F	520	0.35	35.2	E
	NB Off Direct	1	1,500	259	0.17	39.6	E	259	0.17	33.7	D
	NB On Direct (Wagner)	1	1,500	556	0.37	--	F	556	0.37	23.0	C
	NB On Loop + Direct (Magnolia)	1	1,500	911	0.61	--	F	911	0.61	21.4	C
Beach Boulevard & Edinger Avenue	SB Off Direct	1	1,500	577	0.38	--	F	577	0.38	35.6	E
	SB On Direct	1	1,500	1,423	0.95	--	F	1,423	0.95	22.8	C
	NB Off Direct	2	3,000	1,643	0.55	--	F	1,643	0.55	--	B
	NB On Loop	1	1,500	866	0.58	--	F	866	0.58	29.3	D
Godwin Street & Bolsa Avenue	NB On Direct	1	1,500	901	0.20	--	F	901	0.20	25.0	C
	SB Off Direct	2	3,000	1,150	0.39	--	F	1,150	0.39	26.6	C
	SB On Loop	1	1,500	813	0.54	--	F	813	0.54	26.3	C
	SB On Direct	1	1,500	1,058	0.71	--	F	1,058	0.71	22.7	C
Springdale Street & Westminster Boulevard	NB Off Loop	1	1,500	908	0.61	--	F	908	0.61	37.2	E
	NB On Loop	1	1,500	873	0.58	--	F	873	0.58	27.9	C
	SB Off Direct + Loop	1	1,500	1,082	0.72	--	F	1,082	0.72	36.1	E
	SB On Direct + Loop	1	1,500	950	0.64	--	F	950	0.64	23.0	C
Springdale Street & Westminster Boulevard	NB Off Loop	1	1,500	783	0.52	--	F	783	0.52	36.5	E
	NB On Direct	1	1,500	1,008	0.67	--	F	1,008	0.67	22.2	C
	SB Off Direct	1	1,500	382	0.25	--	F	382	0.25	34.5	D
	SB On Loop	1	1,500	289	0.19	--	F	289	0.19	34.0	D
Springdale Street & Westminster Boulevard	SB On Direct	1	1,500	807	0.54	--	F	807	0.54	22.6	C

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Improvement Project Supplemental Traffic Study Alternative 3 Modified

Table 1.4: Alternative 3 Modified (2040) I-405 Ramp Junction Peak Hour Level of Service - AM

Interchange	Ramp Type	Ramp Lanes	Ramp Capacity	Alternative 3 Modified Condition (2040) - AM			
				Peak Condition (Unconstrained Mainline Volume)	Non-Peak Condition (Constrained Mainline Volume)		
				Traffic Volume ¹ d/c	Density ² LOS ³	Traffic Volume ⁴ d/c	Density ² LOS ³
Rosa Chica Road & Garden Grove Boulevard	NB Off Direct	1	1,500	938	0.63	938	0.63
	SB Off Direct	2	3,000	1,448	0.48	1,448	0.48
	SB On Loop	1	1,500	1,074	0.72	1,074	0.72
	NB Off Direct	1	1,500	800	0.53	800	0.53
Socal Beach Boulevard	NB On Loop	1	1,500	852	0.57	852	0.57
	SB Off Loop	2	3,000	983	0.33	983	0.33
	SB On Direct	1	1,500	994	0.66	994	0.66
	NB On from WB SR-22	1	1,500	700	0.47	700	0.47
Freeway-to-Freeway Branch Connectors ⁵							
I-405 Freeway Interchanges with SR-73, SR-22 & I-605	NB On from NB SR-73	3	5,400	3,654	0.68	3,654	0.68
	NB On from WB SR-22	2.5	4,500	7,024	1.56	7,024	1.56
	NB Off to WB SR-22	2	3,600	2,929	0.81	2,929	0.81
	NB Off to NB I-605	2	3,600	3,482	0.97	3,482	0.97
	SB On from SB I-605	2	3,600	4,920	1.37	4,920	1.37
	SB On from EB SR-22	2	3,600	3,074	0.85	3,074	0.85
	SB Off to EB SR-22	3	5,400	7,580	1.40	7,580	1.40
	SB Off to SB SR-73	3	5,400	5,693	1.05	5,693	1.05

Notes:
1. Peak hour capacity and traffic demand forecast volumes are shown in vehicles per hour (vph).
2. Density is shown in passenger cars/mile/hour (pc/mi/hr).
3. Level of Service (LOS) is based on density (pc/mi/hr).
4. Peak hour capacity for freeway ramp include 1,500 vph for each freeway-to-freeway branch connector lane.
5. LOS 1 is the total flow of the merge/diverge area exceeds the capacity of the freeway segment; the density is not applicable in this case.
6. * Per Highway Capacity Manual, as the impact area of merge and diverge is primarily focused on an influence area of 1,500 ft, the density was not calculated for areas exceeding 1,500 ft in length.
7. As the 3 lanes on WB SR-22 are reduced to 2 lanes at I-405 connection, 2.5 lanes are assumed for increased capacity due to forced flow conditions.
8. For freeway-to-freeway branch connectors, d/c ratios are provided.

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Table 1.5: Alternative 3 Modified (2040) I-405 Ramp Junction Peak Hour Level of Service - PM

Interchange	Ramp Type	Ramp Lanes	Ramp Capacity	Alternative 3 Modified Condition (2040) - PM			
				Peak Condition (Unconstrained Mainline Volume)	Non-Peak Condition (Constrained Mainline Volume)		
				Traffic Volume ¹ d/c	Density ² LOS ³	Traffic Volume ⁴ d/c	Density ² LOS ³
Bridal Street	NB On Loop	1	1,500	948	0.23	948	0.23
	NB On Direct	1	1,500	248	0.17	248	0.17
	SB Off Direct	2	3,000	998	0.33	998	0.33
	SB On Loop	1	1,500	1,476	0.98	1,476	0.98
Fairview Road	NB Off Direct	2	3,000	3,625	1.21	3,625	1.21
	NB On Direct	1	1,500	769	0.51	769	0.51
	SB Off Direct	2	3,000	855	0.29	855	0.29
	SB On Direct	1	1,500	1,092	0.73	1,092	0.73
Harbor Boulevard	NB On Loop	1	1,500	628	0.42	628	0.42
	NB On Direct	1	1,500	957	0.54	957	0.54
	SB Off Direct	2	3,000	1,180	0.39	1,180	0.39
	SB On Loop	1	1,500	1,061	0.72	1,061	0.72
Euclid Street & Ellis Avenue	SB On Direct	1	1,500	777	0.52	777	0.52
	NB Off Loop	2	3,000	2,395	0.80	2,395	0.80
	NB On Direct	1	1,500	714	0.48	714	0.48
	SB Off Direct	1	1,500	504	0.34	504	0.34
Brookhurst Street & Talbert Avenue	SB On Direct	1	1,500	897	0.60	897	0.60
	SB On Loop	1	1,500	1,433	0.96	1,433	0.96
	NB Off Direct	2	3,000	1,622	0.54	1,622	0.54
	NB On Loop	1	1,500	1,000	0.67	1,000	0.67
	SB Off Direct	1	1,500	427	0.28	427	0.28
	SB On Direct	1	1,500	1,003	0.67	1,003	0.67
	SB On Loop	1	1,500	752	0.50	752	0.50
	SB On Direct	1	1,500	—	—	—	—

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Improvement Project Supplemental Traffic Study Alternative 3 Modified

Table 1.5: Alternative 3 Modified (2040) I-405 Ramp Junction Peak Hour Level of Service - PM

Interchange	Ramp Type	Ramp Lanes	Ramp Capacity	Alternative 3 Modified Condition (2040) - PM				
				Peak Condition (Unconstrained Mainline Volume)		Non-Peak Condition (Constrained Mainline Volume)		
				Ramp	Ramp Junction	Ramp	Ramp Junction	Ramp
				Traffic Volume ¹	d/c	Density ²	LOS ³	Traffic Volume ¹
Magnolia Street & Warner Avenue	NB Off Loop	1	1,500	878	0.59	--	F	878
	NB Off Direct	1	1,500	777	0.52	--	F	777
	NB On Direct (Warner)	1	1,500	888	0.59	--	F	888
	NB On Loop + Direct (Magnolia)	1	1,500	595	0.40	--	F	595
	SB Off Direct	1	1,500	1,178	0.79	--	F	1,178
	SB Off Loop	1	1,500	597	0.40	40.3	E	597
Beach Boulevard & Edinger Avenue	SB On Loop	1	1,500	378	0.25	23.8	C	378
	SB On Direct	1	1,500	762	0.51	25.5	C	762
	NB Off Direct	2	3,000	2,078	0.69	--	F	2,078
	NB On Loop	1	1,500	1,051	0.71	--	F	1,051
	NB On Direct	1	1,500	791	0.59	--	F	791
	SB Off Direct	2	3,000	1,623	0.54	--	F	1,623
Goldenwest Street & Boka Avenue	SB On Loop	1	1,500	950	0.63	28.9	D	950
	SB On Direct	1	1,500	803	0.54	--	F	803
	NB Off Loop	1	1,500	812	0.54	--	F	812
	NB On Loop	1	1,500	947	0.63	--	F	947
	SB Off (Direct + Loop)	1	1,500	981	0.65	--	F	981
	SB On (Direct + Loop)	1	1,500	1,248	0.83	--	F	1,248
Springdale Street & Westminster Boulevard	NB Off Loop	1	1,500	997	0.66	--	F	997
	NB On Direct	1	1,500	956	0.64	--	F	956
	SB Off Direct	1	1,500	453	0.30	--	F	453
	SB Off Loop	1	1,500	245	0.16	38.3	E	245
	SB On Direct	1	1,500	1,014	0.68	--	F	1,014

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Alternative 3 Modified

Table 1.5: Alternative 3 Modified (2040) I-405 Ramp Junction Peak Hour Level of Service - PM

Interchange	Ramp Type	Ramp Lanes	Ramp Capacity	Alternative 3 Modified Condition (2040) - PM				
				Peak Condition (Unconstrained Mainline Volume)		Non-Peak Condition (Constrained Mainline Volume)		
				Ramp	Ramp Junction	Ramp	Ramp Junction	Ramp
				Traffic Volume ¹	d/c	Density ²	LOS ³	Traffic Volume ¹
Boysa Chica Road & Garden Grove Boulevard	NB Off Direct	1	1,500	1,297	0.86	--	F	1,297
	SB Off Direct	2	3,000	1,243	0.41	--	F	1,243
	SB On Loop	1	1,500	1,288	0.86	--	F	1,288
Seal Beach Boulevard	NB Off Direct	1	1,500	1,140	0.76	--	F	1,140
	NB On Loop	1	1,500	1,072	0.71	--	F	1,072
	SB Off Loop	2	3,000	1,343	0.45	--	F	1,343
	SB On Direct	1	1,500	1,170	0.78	--	F	1,170
Freeway-to-Freeway Branch Connectors ¹								
I-405 Freeway Interchanges with SR-73, SR-22 & I-505	NB On from NB SR-73	3	5,400	5,228	0.97	--	F	5,228
	NB On from WB SR-22	2.5	4,500	5,985	1.35	--	F	5,985
	NB Off to WB SR-22	2	3,600	3,535	0.98	--	F	3,535
	NB Off to NB I-405	2	3,600	5,651	1.57	--	F	5,651
	SB On from SB I-505	2	3,600	3,603	1.00	--	F	3,603
	SB On from SB SR-22	2	3,600	3,112	0.86	--	F	3,112
	SB Off to SB SR-22	3	5,400	7,520	1.39	--	F	7,520
	SB Off to SB SR-73	3	5,400	4,100	0.76	--	F	4,100

Notes:

1. Peak hour capacity and traffic demand forecast volumes are shown in vehicles per hour (vph).
2. Density is shown in passenger cars/mile/hour (pc/mi/h).
3. Level of Service (LOS) is based on density (pc/mi/h) - demand-to-capacity ratio.
4. Peak hour capacities for freeway ramps include 1,500 vph for each freeway-to-freeway branch connector lane.
5. LOS F as the total flow of the merge/diverge area exceeds the capacity of the freeway segment; this density is not applicable in this case.
6. * Per Highway Capacity Manual, as the impact area of merge and diverge is primarily focused on an influence area of 1,500 ft, the density was not calculated for areas exceeding 1,500 ft in length.
7. As the 3 lanes on WB SR-22 are reduced to 2 lanes at I-405 connection, 2.5 lanes are assumed for increased capacity due to forced flow conditions.
8. For freeway-to-freeway branch connectors, d/c ratios are provided.

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Table 1.6 Alternative 3 Modified (2020) Weaving Level-of-Service Freeway and Collector-Distributor Roads				
Weaving Segment	AM Peak Hour		PM Peak Hour	
	Density ¹	LOS ²	Density ¹	LOS ²
Freeway Mainline				
I-405 Northbound - Seal Beach Boulevard to SR-22 Westbound	33.2	D	38.3	E
I-405 Southbound - SR-22 Eastbound to Seal Beach Boulevard	31.2	D	37.7	E
I-405 Southbound - Magnolia Street to Warner Avenue	35.8	E	28.1	D
I-405 Southbound - Harbor Boulevard to Fairview Road	43.9	F	28.5	D
SR-73 Northbound - Bear Street to Fairview Road	19.7	B	24.1	C
SR-73 Southbound - Fairview Road to Bear Street	25.2	C	19.8	B
Collector-Distributor (C-D) Roads				
Goldenwest Street & Bolsa Avenue Interchange at I-405				
Southbound C-D Road	22.2	B	12.6	B
Katella Avenue/Willow Street Interchange at I-605				
Southbound C-D Road	53.6	F	53.2	F

Notes:

1. Density is shown in passenger cars/mile/lane (pc/mi/ln).
2. Level of Service (LOS) is based on density (pc/mi/ln). The density LOS thresholds are different for the freeway mainline and collector-distributor roads. Refer to Table 2.1.3 for the LOS criteria.
3. Highway Capacity Software analysis worksheets are included in Appendix E1.

Alternative 3 Modified

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Table 1.7 Alternative 3 Modified (2040) Weaving Level-of-Service Freeway								
Freeway Mainline Weaving Segment	Alternative 3 Modified Condition (2040) - AM				Alternative 3 Modified Condition (2040) - PM			
	Peak Condition (Unconstrained Mainline Volume)		Non-Peak Condition (Constrained Mainline Volume)		Peak Condition (Unconstrained Mainline Volume)			
	Non-Peak Condition (Constrained Mainline Volume)		Peak Condition (Unconstrained Mainline Volume)		Non-Peak Condition (Constrained Mainline Volume)			
	Density ³	LOS ²	Density ¹	LOS ²	Density ³	LOS ²		
I-405 Northbound - Seal Beach Boulevard to SR-22 Westbound	42.0	E	34.1	D	47.6	F	41.3	E
I-405 Southbound - SR-22 Eastbound to Seal Beach Boulevard	36.8	E	34.4	D	40.1	E	39.2	E
I-405 Southbound - Magnolia Street to Warner Avenue	48.0	F	34.9	D	33.8	D	28.7	D
I-405 Southbound - Harbor Boulevard to Fairview Road	49.1	F	41.2	E	31.4	D	29.5	D
SR-73 Northbound - Bear Street to Fairview Road	21.5	C	21.5	C	27.2	C	25.2	C
SR-73 Southbound - Fairview Road to Bear Street	28.3	D	28.4	D	22.3	C	22.3	C

Notes:

1. Density is shown in passenger cars/mile/lane (pc/mi/ln).
2. Level of Service (LOS) is based on density (pc/mi/ln). The density LOS thresholds for the freeway mainline are shown in Table 2.1.3.
3. Highway Capacity Software analysis worksheets are included in Appendix E2.

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Alternative 3 Modified

Table 1.8 Alternative 3 Modified (2040) Weaving Level-of-Service
Collector-Distributor (C-D) Roads

Interchange Weaving Segment	AM Peak Hour		PM Peak Hour	
	Density ¹	LOS ²	Density ¹	LOS ²
Goldenwest Street & Bolsa Avenue Interchange at I-405				
Southbound C-D Road	24.0	B	13.4	B
Katella Avenue/Willow Street Interchange at I-605				
Southbound C-D Road	56.2	F	55.7	F

Notes:

1. Density is shown in passenger cars/mile/lane (pc/mi/ln).
2. Level of Service (LOS) is based on density (pc/mi/ln). The density LOS thresholds for the C-D roads are shown in Table 2.1.3.
3. Highway Capacity Software analysis worksheets are included in Appendix E2.

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Alternative 3 Modified

Table 1.9: Level of Service and Throughput Summary
Alternative 3 Modified (2040) - AM & PM

Study Segment	Level of Service ¹					
	No Build Alternative			Alternative 3 Modified		
	NB		SB	NB		SB
	GP	HOV	GP	GP	HOV/Express	GP
SR-73 to Euclid	F	F	F	F	F	F
Euclid to SR-22 East	F	F	F	F	F	F
SR-22 East to I-605	F	F	F	F	F	F

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Study Segment		Throughput ²												Percent Increase in Throughput (over No Build)			
		No Build Alternative						Alternative 3 Modified									
		NB		SB		NB		SB		NB		SB					
		GP	HOV	GP	HOV	GP	HOV/Express	GP	HOV/Express	GP	HOV/Express	GP	HOV/Express				
SR-73 to Euclid	Lanes	5	1	6	1	5	1	6	1	5	1	6	1	5	1	6	1
	Throughput	7200	1200	7200	1200	7200	1200	7200	1200	7200	1200	7200	1200	7200	1200	7200	1200
	Lanes	4	8400	1	4	1	5	2	5	2	5	2	5	2	5	2	5
Euclid to SR-72 East	Lanes	4800	1200	4800	1200	4800	1200	4800	1200	4800	1200	4800	1200	4800	1200	4800	1200
	Throughput	6000	6000	4800	8400	6000	6000	4800	8400	6000	6000	4800	8400	6000	6000	4800	8400
	Lanes	6	2	6	2	7	2	7	2	7	2	7	2	7	2	7	2
SR-22 East to I-605	Lanes	7200	2400	7200	2400	7200	2400	7200	2400	7200	2400	7200	2400	7200	2400	7200	2400
	Throughput	7200	2400	7200	2400	7200	2400	7200	2400	7200	2400	7200	2400	7200	2400	7200	2400
	Lanes	6	2	6	2	7	2	7	2	7	2	7	2	7	2	7	2

Notes:

1. Level of Service (LOS) is based on density (pc/mi/ln) per Highway Capacity Manual.
2. Traffic flow throughput for each GP and HOV lane is 1,200 vehicles/hour under congested (LOS F) conditions.
3. Traffic flow throughput for each managed Express lane is equivalent to two GP lanes (each GP lane).
4. LOS reported is for worst case, LOS within each study segment.
5. The LOS shown above applies for both AM and PM peak periods.

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I-405 Improvement Project Supplemental Traffic Study

Alternative 3 Modified

Table 1.10: Speed Index and Demand-to-Capacity Ratio Summary
Alternative 3 Modified (2040) - AM & PM

Speed Index¹

Study Segment	No Build Alternative				Alternative 3 Modified			
	NB		SB		NB		SB	
	GP	HOV	GP	HOV	GP	HOV/Express	GP	HOV/Express
SR-73 to Euclid	AM	41	6	6	41	41	6	6
	PM	19	32	32	19	19	32	32
Euclid to SR-22 East	AM	6	5	5	40	65	17	65
	PM	5	7	7	30	65	42	65
SR-22 East to I-605	AM	7	15	5	10	22	65	14
	PM	7	15	8	19	22	65	24

Demand-to-Capacity Ratio²

Study Segment	No Build Alternative				Alternative 3 Modified			
	NB		SB		NB		SB	
	GP	HOV	GP	HOV	GP	HOV/Express	GP	HOV/Express
SR-73 to Euclid	AM	1.23	1.63	1.63	1.23	1.23	1.63	1.63
	PM	1.41	1.41	1.28	1.28	1.41	1.28	1.28
Euclid to SR-22 East	AM	1.64	1.64	1.89	1.89	0.78	1.72	0.86
	PM	1.76	1.76	1.61	1.61	0.86	1.29	0.80
SR-22 East to I-605	AM	1.51	1.36	1.57	1.43	0.92	1.49	0.92
	PM	1.52	1.37	1.47	1.43	0.92	1.18	0.92

- Notes:
1. Relative Speed Index is based on Demand-to-Capacity ratios and speed curves developed by Bay Area Metropolitan Transportation Commission.
 2. Demand-to-Capacity ratio reported is for worst case link within each study segment.
 3. GP = General Purpose; HOV = High Occupancy Vehicle.

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I-405 Improvement Project Supplemental Traffic Study

Alternative 3 Modified

Table 1.11: Alternative 3 Modified (2020) I-405 Mainline Transition Areas Peak Hour Level of Service

Location	Direction	Mainline		Alternative 3 Modified Condition (2020)			
		Lanes	Capacity ^{1,4}	AM Peak Hour		PM Peak Hour	
				Traffic Demand Volume ¹	d/c	Traffic Demand Volume ¹	d/c
I-405 - Harbor Blvd to Euclid St	NB	7	12,950	13,915	1.07	15,715	1.21
	SB	7	12,950	18,067	1.40	14,693	1.13
I-405 - I-605 to End HOV Access	NB	5	9,350	11,807	1.29	9,860	1.07
	SB	5	9,350	10,812	1.17	11,080	1.20
SR-22 - End HOV Restriction to Valley View St	WB	3	5,550	6,764	1.22	6,406	1.15
	EB	4	7,400	5,321	0.83	6,154	0.84
I-605 - Direct Connector Separation to End HOV Access	NB	5	9,350	7,956	0.85	9,657	1.04
	SB	5	9,350	8,295	0.89	7,046	0.76

- Notes:
1. Peak hour capacity and traffic volumes are shown in vehicles per hour (vph).
 2. Density is shown in passenger car/mile/line (pc/mi/ln).
 3. Level of Service (LOS) is based on density except when demand-to-capacity (d/c) ratio is greater than or equal to 1.0, which is LOS F.
 4. Peak hour capacities for freeway lanes include 1,800 vph for each lane.
 5. *Density is in excess of 45 pc/mi/ln; therefore LOS is F.

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Alternative 3 Modified

Table 1.12: Alternative 3 Modified (2040) I-405 Mainline Transition Area Peak Hour Level of Service									
Location	Direction	Mainline			Alternative 3 Modified Condition (2040)				
		Lanes	Capacity ^{1,2}	Traffic Demand Volume ³	AM Peak Hour	PM Peak Hour	LOS ⁴	Density ⁵	Density ⁵
I-405 - Harbor Blvd to Exited St	NB	7	12,950	15,868	1.13	1.13	F	1.41	1.41
	SB	7	12,950	21,081	1.63	1.63	F	1.78	1.78
I-405 - I-805 to Exit HOV Access	NB	5	9,250	13,905	1.50	1.50	F	11.42	11.42
	SB	5	9,250	13,904	1.43	1.43	F	13.025	13.025
SR-22 - End HOV Restriction to Valley View St	WB	3	5,350	7,724	1.19	1.19	F	7.888	7.888
	EB	4	7,400	8,280	1.12	1.12	F	8.220	8.220
I-405 - Direct Connector Separation to End HOV Access	NB	5	9,250	9,547	0.98	0.98	D	11.941	11.941
	SB	5	9,250	9,762	1.15	1.15	F	8.411	8.411

Notes:

1. Peak hour capacity and traffic volumes are shown in vehicles per hour (vph).
2. Density is shown in passenger cars/mile/lane (pc/mi/ln).
3. Level of Service (LOS) is based on density except when demand-to-capacity (d/c) ratio is greater than or equal to 1.0, which is LOS F.
4. Peak hour capacities for freeway lanes include 1,850 vph for each lane.
5. *Density is in excess of 45 pc/mi/ln; therefore LOS is F.

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I-405 Improvements Project Supplemental Traffic Study

Alternative 3 Modified

Table 1.13 Alternative 3 Modified Intersection Level of Service
I-405 Southbound Ramps & Magnolia Street

Analysis Year	Location		Traffic Control	AM Peak Hour				PM Peak Hour			
	East/West Street	North/South Street		No Build Conditions	Project Conditions (Build Traffic)	Project Conditions (Build Traffic)	Project Conditions (Build Traffic)	No Build Conditions	Project Conditions (Build Traffic)	Project Conditions (Build Traffic)	Project Conditions (Build Traffic)
				V/C	LOS	Avg Delay (sec)	V/C	LOS	Avg Delay (sec)	V/C	LOS
Existing (2005)	I-405 SB On-Ramp (From SR Magnolia St)	Magnolia St	Unsignalized Loop On-Ramp	0.65	--	--	--	--	--	--	--
	I-405 SB Off-Ramp (To SR 22)	Magnolia St	Existing Traffic Signal	0.85	C	23.0	--	--	--	--	--
	I-405 SB On-Ramp (From SR Magnolia St)	Magnolia St	Unsignalized Loop On-Ramp	0.71	--	--	--	--	--	--	--
	I-405 SB Off-Ramp (To SR 22)	Magnolia St	Existing Traffic Signal	0.99	D	38.7	--	--	--	--	--
2040	I-405 SB On-Ramp (From SR Magnolia St)	Magnolia St	Unsignalized Loop On-Ramp	0.71	--	--	0.77	D	--	0.71	B
	I-405 SB Off-Ramp (To SR 22)	Magnolia St	Existing Traffic Signal	0.71	--	--	--	--	--	--	--
2040	I-405 SB On-Ramp (From SR Magnolia St)	Magnolia St	Unsignalized Loop On-Ramp	0.71	--	--	0.77	D	--	0.71	B
	I-405 SB Off-Ramp (To SR 22)	Magnolia St	Existing Traffic Signal	0.71	--	--	--	--	--	--	--

Notes:

1. LOS is level of service per delay methodology (2000 Highway Capacity Manual).
2. Level of service analysis worksheets are included in Appendix B.
3. *P* is due to excessive volume-to-capacity ratio (over 1.0), the intersection is expected to operate at LOS F.
4. No Build Condition analysis is based on No Build Traffic and geometry.
5. Project Condition (Build Traffic) No Improvements. Analysis is based on Project Traffic under No Build Geometry.
6. Project Condition (Build Traffic) With Improvements. Analysis is based on Project Traffic under Build Geometry.

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Improvement: Project Supplemental Traffic Study Alternative 3 Modified

Table 1.14: Alternative 3 Modified (2020) - Design Option
I-405 Ramp Junction Peak Hour Level of Service

Interchange	Ramp Type	Ramp Lanes	Ramp Capacity ^{1,4}	Alternative 3 Modified Condition							
				AM Peak				PM Peak			
				Ramp		Ramp Junction		Ramp		Ramp Junction	
				Traffic Volume ¹	d/c ²	Density ³	LOS ^{2,5}	Traffic Volume ¹	d/c ²	Density ³	LOS ^{2,5}
Magnolia Street & Warner Avenue	NB Off Loop	1	1,500	505	0.34	36.3	E	781	0.52	---	F
	NB Off Direct (C-D Road)	1	1,500	236	0.16	33.2	D	673	0.45	38.7	E

Notes:

1. Peak hour capacity and traffic demand forecast volumes are shown in vehicles per hour (vph).
2. Density is shown in passenger cars/mile/lane (pc/mi/ln).
3. Level of Service (LOS) is based on density (pc/mi/ln). d/c - demand to capacity ratio.
4. Peak hour capacities for freeway ramps include 1,500 vph for each freeway ramp lane and 1,800 vph for each freeway-to-freeway branch connector lane.
5. LOS F as the total flow of the merge/diverge area exceeds the capacity of the freeway segment; the density is not applicable in this case.

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Improvement: Project Supplemental Traffic Study

Alternative 3 Modified

Table 1.15: Alternative 3 Modified (2040) - Design Option
I-405 Ramp Junction Peak Hour Level of Service - AM

Interchange	Ramp Type	Ramp Lanes	Ramp Capacity	Alternative 3 Modified Condition (2040) - AM							
				Peak Condition (Unconstrained Mainline Volume)				Non-Peak Condition (Constrained Mainline Volume)			
				AM Peak		PM Peak		AM Peak		PM Peak	
				Ramp	Ramp Junction	Ramp	Ramp Junction	Ramp	Ramp Junction	Ramp	Ramp Junction
				Traffic Volume ¹	d/c	Density ²	LOS ^{3,5}	Traffic Volume ¹	d/c	Density ²	LOS ^{3,5}
Magnolia Street & Warner Avenue	NB Off Loop	1	1,500	520	0.35	—	F	520	0.35	35.2	E
	NB Off Direct (C-D Road)	1	1,500	259	0.17	39.6	E	259	0.17	33.7	D

Notes:

1. Peak hour capacity and traffic demand forecast volumes are shown in vehicles per hour (vph).
2. Density is shown in passenger cars/mile/lane (pc/mi/ln).
3. Level of Service (LOS) is based on density (pc/mi/ln). d/c - demand to capacity ratio.
4. Peak hour capacities for freeway ramps include 1,500 vph for each freeway ramp lane and 1,800 vph for each freeway-to-freeway branch connector lane.
5. LOS F as the total flow of the merge/diverge area exceeds the capacity of the freeway segment; the density is not applicable in this case.

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Improvement: Project Supplemental Traffic Study Alternative 3 Modified

Table 1.16: Alternative 3 Modified (2040) - Design Option
I-405 Ramp Junction Peak Hour Level of Service - PM

Interchange	Ramp Type	Ramp Lanes	Ramp Capacity	Alternative 3 Modified Condition (2040) - PM				Non-Peak Condition (Constrained Mainline Volume)			
				Peak Condition (Unconstrained Mainline Volume)		PM Peak		Ramp		Ramp Junction	
				AM Peak		PM Peak		Ramp		Ramp Junction	
				Traffic Volume ³	d/c	Traffic Volume ³	d/c	Traffic Volume ³	d/c	Traffic Volume ³	LOS ^{4,5}
Magnolia Street & Warner Avenue	NB Off Loop	1	1,500	878	0.59	F	0.59	878	0.59	37.0	E
	NB Off Direct (C-D Road)	1	1,500	777	0.52	F	0.52	777	0.52	36.4	E

- Notes:
1. Peak hour capacity and traffic demand forecast volumes are shown in vehicles per hour (vph).
 2. Density is shown in passenger cars/mile/lane (pc/mi/ln).
 3. Level of Service (LOS) is based on density (pc/mi/ln). d/c - demand-to-capacity ratio.
 4. Peak hour capacities for freeway ramps include 1,500 vph for each freeway ramp lane and 1,800 vph for each freeway-to-freeway branch connector lane.
 5. LOS F as the total flow of the merge/diverge area exceeds the capacity of the freeway segment; this density is not applicable in this case.

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I-405 Improvement Project Supplemental Traffic Study

Alternative 3 Modified

Table 1.17 Alternative 3 Modified (2020) - Design Option
Weaving Level-of-Service
Collector-Distributor Roads

Weaving Segment	AM Peak Hour		PM Peak Hour	
	Density ¹	LOS ²	Density ¹	LOS ²
Collector-Distributor (C-D) Roads				
Warner Ave and Magnolia Street Interchange at I-405				
Northbound C-D Road	13.1	B	29.4	D

- Notes:
1. Density is shown in passenger cars/mile/lane (pc/mi/ln).
 2. Level of Service (LOS) is based on density (pc/mi/ln). The density LOS thresholds are different for the freeway mainline and collector distributor roads. Refer to Table 2.1.3 for the LOS criteria.

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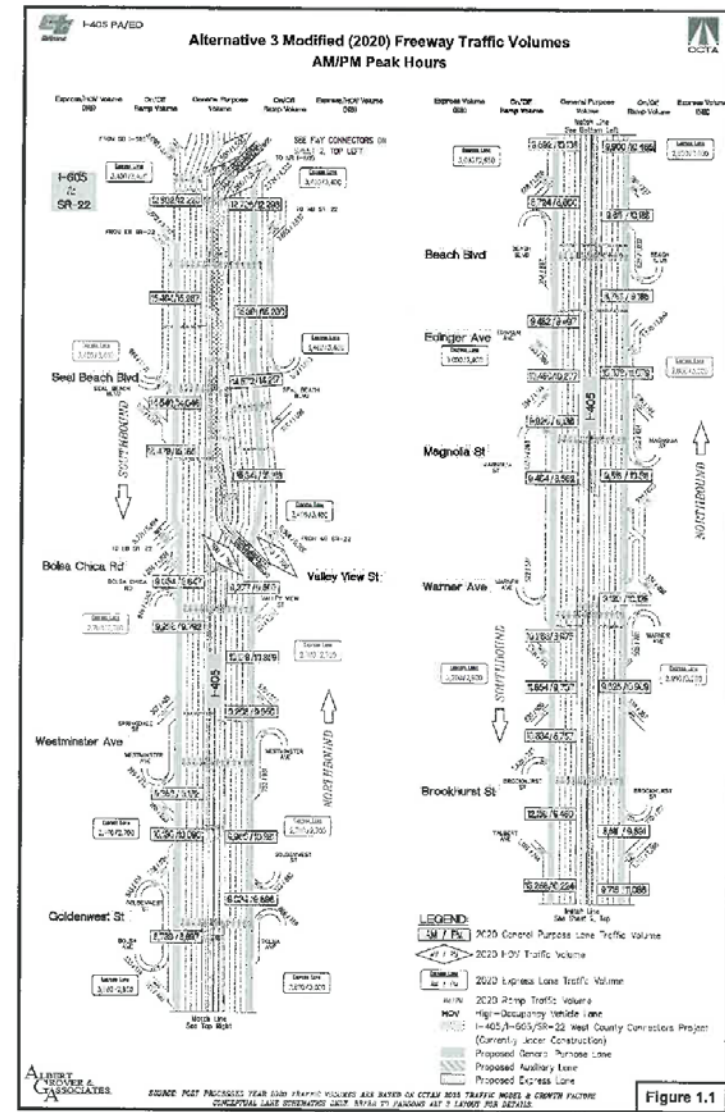
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Alternative 3 Modified

Weaving Segment	AM Peak Hour		PM Peak Hour	
	Density ¹	LOS ²	Density ¹	LOS ²
Collector-Distributor (C-D) Roads				
Warner Ave and Magnolia Street Interchange at I-405				
Northbound C-D Road	14.0	B	32.5	D

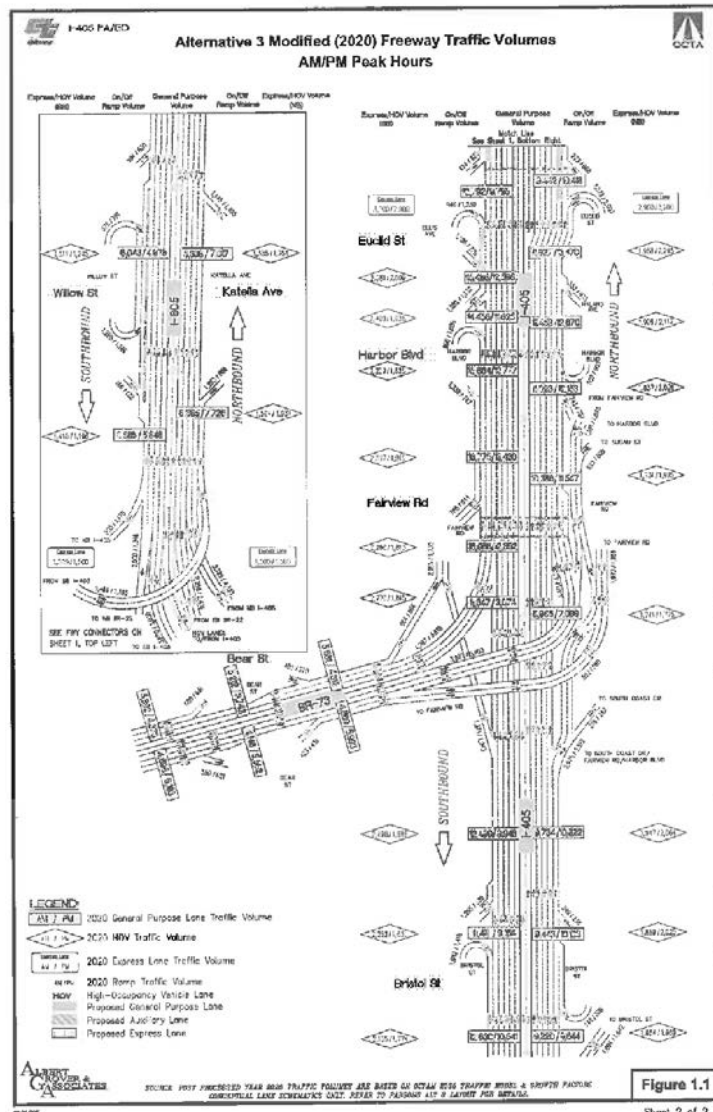
1. Density is shown in passenger cars/mile/lane (pc/mi/ln).
2. Level of Service (LOS) is based on density (pc/mi/ln). The density LOS thresholds are different for the freeway mainline and collector-distributor roads. Refer to Table 2.1.3 for the LOS criteria.



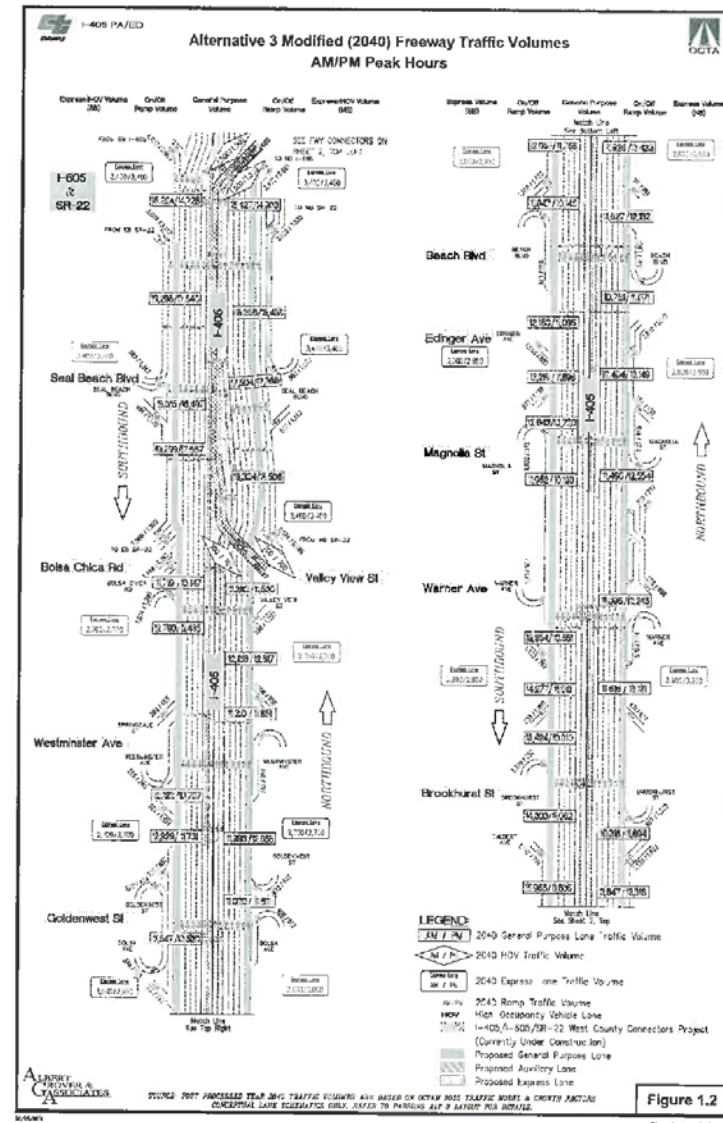
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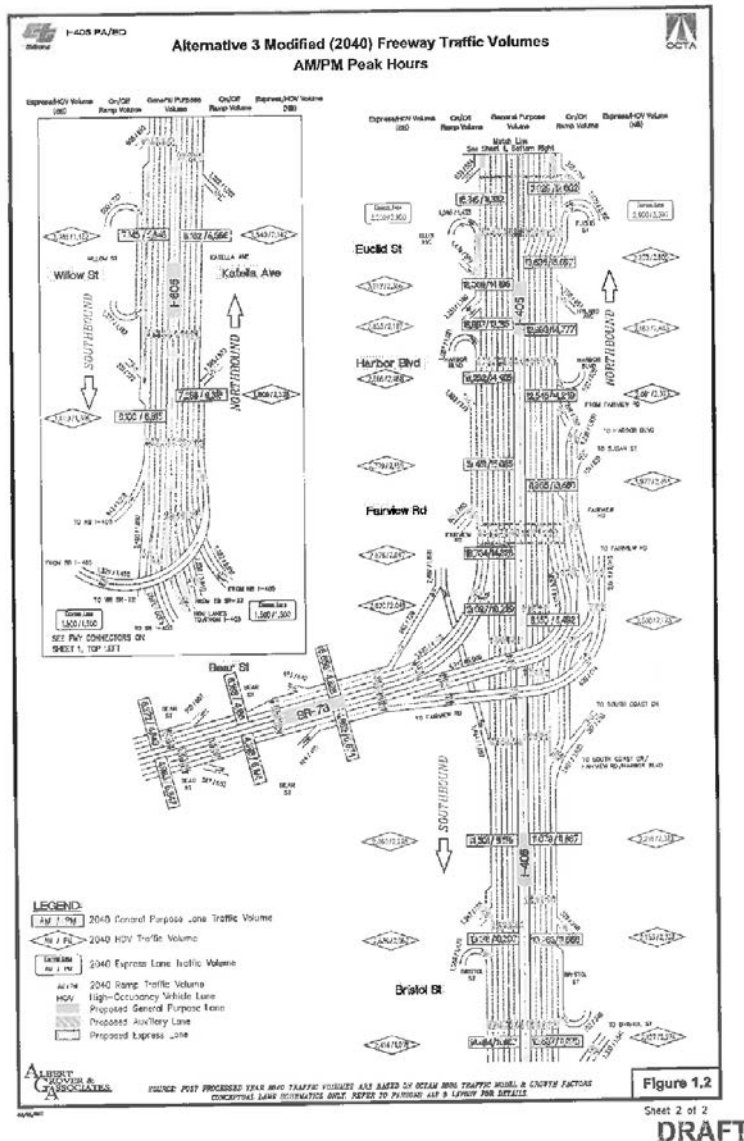


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I-405 Improvement Project Supplemental Traffic Study

Magnolia/Warner Interchange

2.0 MAGNOLIA/WARNER INTERCHANGE

Traffic operations are evaluated for two design options at the Magnolia/Warner interchange. The first design option provides a southbound auxiliary lane from the Magnolia Street on-ramp to a point south of the Warner Avenue off-ramp in lieu of the southbound braided ramps proposed in the DEIR/EIS. The second design option provides a northbound C-D road serving the Warner Avenue on-ramp to and the Magnolia Street off-ramp from northbound I-405 mainline in lieu of the braided ramps proposed in the DEIR/EIS. Analysis provided below is based on Alternative 1 traffic conditions. The analysis for Alternatives 2 and 3 are assumed to be generally similar to Alternative 1.

2.1 I-405 Southbound Auxiliary Lane for Magnolia and Warner Ramps

Under this design option the weave between the on-ramp to southbound I-405 from Magnolia Street and the off-ramp from southbound I-405 to Warner Avenue would be treated with an auxiliary lane extending from the Magnolia Street on-ramp beyond the Warner off-ramp for a distance of approximately 1,688 feet where it would be dropped with a taper extending an additional 600 feet. The auxiliary lane and taper would end approximately 481 feet north of the six (6) foot separation between the Warner Avenue on-ramp and southbound I-405.

The on-ramp to southbound I-405 from Magnolia Street would have two lanes from the Magnolia Street intersection to the ramp meter, a distance of 754 feet. Downstream of the ramp meter the ramp would taper to a single lane entering the freeway at the beginning of the auxiliary lane described in the preceding paragraph.

In the event that the amount of storage upstream of the ramp meter limit line on the on-ramp to southbound I-405 from Magnolia Street is inadequate to contain ramp meter queuing, the Project Condition lane configuration at the intersection of the I-405 Southbound Ramps and Magnolia Street would be reconfigured from the configuration included in the DEIR/EIS. The reconfiguration would provide three exclusive northbound through lanes, two exclusive southbound through lanes, one exclusive southbound right turn lane, dual left-turn lanes eastbound and dual-right turn lanes eastbound. The intersection would be signalized.

The analysis consists of two components:

- Weaving analysis on southbound I-405 between the Magnolia Street on-ramp and the Warner Avenue off-ramp; and
- Intersection LOS analysis of the Magnolia/SB intersection.

The HCS weaving analysis worksheets and the Synchro intersection LOS analysis worksheets are presented in the Appendix III A.

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I-405 Improvement Project Supplemental Traffic Study

Magnolia/Warner Interchange

Weaving Analysis

Weaving analysis was conducted for the proposed auxiliary lane between the on-ramp to southbound I-405 from Magnolia Street and the off-ramp from southbound I-405 to Warner Avenue. Analysis was conducted for both AM and PM peak hours in both the opening year (2020) and the design year (2040). The traffic volumes used for the analysis are those reported in the Traffic Study in Figures 2.5.1 and 2.5.2. However, the HCS software used for the analysis is limited to a weaving section with 5 lanes. The proposed weaving section would have 6 lanes (5 mainline GP lanes and the auxiliary lane). Therefore, the volumes input to the HCS software were adjusted to remove the through volumes associated with one GP lane.

The analysis shows that the weaving section is anticipated to operate at LOS E and D during the AM and PM peak hours, respectively, in 2020 and LOS F and E in 2040. Figures 2.5.1 and 2.5.2 of the Traffic Study show the minimum southbound mainline peak hour volume under Alternative 1 in the vicinity of the Magnolia/Warner interchange is 9,593. A volume of 9,593 exceeds the capacity of the Alternative 1 southbound GP lanes (1,850 vehicles per lane per hour x 5 GP lanes = 9,250). Given this over capacity condition, it is unlikely that the weaving segment will operate better than LOS F.

Consistent with Section 2.1.3 Weaving Analysis Methodology of the Traffic Study, an additional weaving analysis was conducted for year 2040 using mainline freeway volumes constrained to a maximum volume per lane of 1,850 vehicles per hour. By constraining the mainline volumes, the second analysis provides an evaluation of the weaving without being overshadowed by oversaturated conditions on the freeway. This analysis of constrained freeway volumes provides an analysis of how well the weaving section is anticipated to operate when the freeway mainline is congested but not oversaturated, as in shoulder hours rather than peak hours. The constrained analysis shows that the weaving segment is anticipated to operate at LOS E and D, respectively, during the AM and PM shoulder hours.

Intersection LOS Analysis

The amount of available storage on the Magnolia Street on-ramp to southbound I-405 upstream of the ramp meter limit line is 754 feet per lane for each of the two lanes. Table 3.8.6 in the Traffic Study shows the ramp meter queues for a two lane on-ramp upstream of the ramp meter under project conditions. The table shows that a maximum queue length of approximately 25 feet per lane is anticipated with a metering rate of 650 vehicles per hour (using a meter cycle length of approximately 5.5 seconds).

In the event that a metering rate is selected that causes traffic to queue beyond the ramp onto southbound Magnolia Street, intersection LOS analysis was conducted to determine if the ramp intersection with Magnolia Street would operate acceptably with the curb lane dedicated to exclusively serving ramp traffic. The analysis shows that the intersection is anticipated to operate at LOS A during the AM peak hour and LOS B during the PM peak hour in years 2020 and 2040.

For comparison purposes, Table 2.1 summarizes LOS, v/c ratios and average delays under the No Build Condition and Project traffic under No Build lane geometrics. As shown in Table 2.1, the proposed intersection geometrics under Project Condition allows the I-405 Southbound Off-

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I-405 Improvement Project Supplemental Traffic Study

Magnolia/Warner Interchange

Ramp/Magnolia Street intersection to operate at LOS B or better compared to LOS F under the 2040 No Build Condition. The intersection does not meet the significant impact criteria and there are no significant traffic impacts at the intersection.

2.2 Design Option for I-405 Northbound Between Warner Avenue and Magnolia Street

Under this design option a C-D road serving the Warner on-ramp to and the Magnolia Street off-ramp from northbound I-405 would be provided. The off-ramp to Warner from northbound I-405 would be served by a separate ramp departing the I-405 mainline 1,000 feet upstream of the exit to the proposed C-D road. The on-ramp Magnolia Street would be served by a separate ramp entering the I-405 mainline 2,078 feet downstream of the C-D road entrance to the freeway mainline.

Operationally the ramps and their volumes entering and exiting the I-405 northbound mainline are the same as those evaluated in the Traffic Study. Therefore, the ramp junction analysis presented in Tables 2.5.3, 2.5.4, and 2.5.5 of the Traffic Study apply to this design option. The only operational difference between this design option and the braided ramp design analyzed in the Traffic Study is that the traffic volumes using the Warner on-ramp and the Magnolia Street off-ramp from northbound I-405 would weave on the proposed C-D road. In the Traffic Study these ramps are braided so that there is no weaving maneuver.

Weaving analysis was conducted for the volumes weaving on the proposed C-D road. The HCS weaving analysis worksheets are presented in the Appendix III B. The worksheets for year 2020 show that the weaving section is anticipated to operate at LOS B and C during the AM and PM peak hours, respectively. The worksheets for year 2040 show that the weaving section is anticipated to operate at LOS B and D during the AM and PM peak hours, respectively.

I-405 Improvement Project Supplemental Traffic Study

Magnolia/Warner Interchange

Analysis Year	Location	Traffic Control	AM Peak Hour						PM Peak Hour					
			No Build Condition			Project Conditions (Build Traffic)			No Build Condition			Project Conditions (Build Traffic)		
			No Build Condition			Project Conditions (Build Traffic)			No Build Condition			Project Conditions (Build Traffic)		
			Avg Delay (sec)	LOS	V/C	Avg Delay (sec)	LOS	V/C	Avg Delay (sec)	LOS	V/C	Avg Delay (sec)	LOS	V/C
Existing (2000)	I-405 SB On-Ramp (from SB Magnolia St)	Unsignalized (Loop On Ramp)	0.66	-	-	-	-	-	0.23	-	-	-	-	-
	I-405 SB Off-Ramp (to NB & SB Magnolia St)	Unsignalized (Loop On Ramp)	0.68	23.0	C	-	-	-	0.77	18.0	B	-	-	-
	I-405 SB On-Ramp (from SB Magnolia St)	Unsignalized (Loop On Ramp)	0.71	-	-	0.71	-	-	0.24	-	-	0.71	10.2	B
	I-405 SB Off-Ramp (to NB & SB Magnolia St)	Unsignalized (Loop On Ramp)	0.97	36.7	D	0.99	36.7	D	0.80	16.7	B	0.83	16.4	B
	I-405 SB On-Ramp (from SB Magnolia St)	Unsignalized (Loop On Ramp)	0.71	-	-	0.71	-	-	0.24	-	-	0.71	10.2	B
2020	I-405 SB On-Ramp (from SB Magnolia St)	Unsignalized (Loop On Ramp)	0.71	-	-	0.71	-	-	0.24	-	-	0.71	10.2	B
	I-405 SB Off-Ramp (to NB & SB Magnolia St)	Unsignalized (Loop On Ramp)	0.97	36.7	D	0.99	36.7	D	0.80	16.7	B	0.83	16.4	B
2040	I-405 SB On-Ramp (from SB Magnolia St)	Unsignalized (Loop On Ramp)	0.71	-	-	0.71	-	-	0.24	-	-	0.71	10.2	B
	I-405 SB Off-Ramp (to NB & SB Magnolia St)	Unsignalized (Loop On Ramp)	0.97	36.7	D	0.99	36.7	D	0.80	16.7	B	0.83	16.4	B

Notes:
1. LOS: Level of Service per delay methodology (2000 Highway Capacity Manual).
2. Level of Service analysis was based on the intersection is anticipated to operate at LOS F.
3. Due to excessive weaving capacity ratio (over 1.0), the intersection is anticipated to operate at LOS F.
4. No Build Condition analysis is based on No Build traffic and geometry.
5. Project Condition (Build Traffic) Weaving analysis is based on Project build traffic under No Build geometry.
6. Project Condition (Build Traffic) Weaving analysis is based on Project build traffic under build geometry.

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I-405 Improvement Project Supplemental Traffic Study

I-405 Northbound Approaching I-605

3.0 I-405 NORTHBOUND APPROACHING I-605

An operational analysis was conducted of northbound I-405 as it approaches the Seal Beach Boulevard, SR-22/7th Street, and I-605 interchanges. The purpose of the analysis is to evaluate the potential for disruption of smooth traffic flow to occur in this area as the additional lanes proposed in the build alternatives are terminated. The additional lanes proposed in each of the build alternatives continue into receiving lanes on branch connectors to SR-22/7th Street westbound and I-605 northbound. If more motorists desire to continue northbound on I-405 into LA County than there is freeway capacity continuing northbound on I-405 into LA County, there is the potential for disruption of the traffic flow along I-405.

The analysis is limited to the general purpose (GP) lanes. The study area includes northbound I-405 from the SR-22 confluence near Valley View Street through the exit to I-605 northbound and traffic data were collected for that area. The study takes speed as the primary indicator of a disruption of the smooth flow of traffic. Based on the information presented in the Traffic Study in Tables 3.1.6-4 and 3.1.6-12, the GP lanes of I-405 within the study area are anticipated to be over capacity during peak hours in years 2020 and 2040 with or without the proposed project and operating at LOS F under severely congested conditions. Section 4 of this Supplement shows that I-405 north of the project limits is also anticipated to operate under heavily congested conditions. Accordingly, it is not possible to accurately assess peak hour congestion attributable to the termination of the proposed new lanes, because heavy congestion is anticipated to occur along the entire corridor during peak hours regardless of the proposed project. Therefore, rather than evaluating conditions during peak hours, the analysis here evaluates "shoulder" hours (hours immediately preceding or following peak hours) during which the freeway is expected to be operating at or just below capacity; mainline freeway volumes used in the analysis are constrained to values indicative of somewhat limited congestion compared to extensive congestion anticipated during peak hours.

3.1 Existing Condition

Peak hour volume and speed data were collected from the California Freeway Performance Measurement System (PEMS) for Tuesdays through Fridays during the month of March, 2009 at the following locations along northbound I-405:

- North of the SR-22 merge near Valley View Street;
- Between the ramps serving Seal Beach Boulevard;
- North of the SR-22/7th Street exit; and
- North of the exit to I-605 northbound.

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I-405 Improvement Project Supplemental Traffic Study

I-405 Northbound Approaching I-605

From the 17 days of data in March 2009, the daily AM and PM peak traffic hours were identified for the segment of I-405 north of the SR-22 merge. The peak hours identified north of the SR-22 merge were used to determine the average AM and PM peak hour volumes that are shown in Table 3.1. The average speeds for those same peak hours are also shown and were calculated by averaging the 12 five (5)-minute interval speeds that occurred over the peak hour.

Table 3.1 shows that, during the PM peak hour, the existing reduction in the number of lanes in the northbound direction at the exits to SR-22/7th Street westbound and I-605 northbound does not adversely affect speeds. Indeed, the data show that, as traffic and lanes exit I-405 northbound, traffic speeds through the area increase.

However, during the AM peak hour the data show that traffic speeds are reduced under the existing condition as motorists travel northbound along I-405 from SR-22 near Valley View Street to the I-605 interchange. Average speeds north of the exit to I-605 northbound during the AM peak hour prior to construction of the WCC project slow to an average of 49 miles-per-hour (mph) with some stop-and-go conditions.

The AM peak hour volume and speed data for the segment of I-405 north of the exit to I-605 northbound are affected by congestion from the merge into northbound I-405 of the entrance ramp from southbound I-605. PEMS data for the AM peak hour volume and speed data show an hourly volume of 7,397 with an average speed of 46 mph in this congested area. This congested area backs into the upstream segment of northbound I-405 north of the exit to I-605 northbound and disrupts the traffic flow in that segment. If the congestion at the merge into northbound I-405 of the entrance ramp from southbound I-605 did not exist, traffic volumes and speeds on the upstream segment of northbound I-405 would be substantially higher.

The magnitude of the existing AM traffic flow disruption of I-405 northbound traffic approaching the Seal Beach Boulevard, SR-22/7th Street, and I-605 interchange area is limited by upstream geometrics that "meter" (or limit) the maximum volume of I-405 northbound traffic approaching the area. If upstream geometrics permitted a higher traffic volume per hour to approach the Seal Beach Boulevard, SR-22/7th Street, and I-605 interchange area the magnitude of the traffic flow disruption would increase.

3.2 Future 2040 Condition

Forecasts of future condition general purpose lane speeds are based on the following process. Under existing conditions the segment of northbound I-405 north of the SR-22 merge near Valley View Street operates at capacity during both AM and PM peak hours. Future traffic demand for this freeway segment is over capacity. (Refer to Traffic Study Tables 3.1.6-4 and 3.1.6-12.) It is therefore assumed that the maximum existing volume per lane in this segment would represent the future maximum operating volume per lane in this segment. The forecast AM and PM peak hour general purpose lane volumes in this segment are therefore the volume per lane under existing conditions multiplied by the number of lanes in each of the proposed alternatives. The 2040 northbound forecast volumes used in this analysis are presented in Table 3.2.

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I-405 Improvement Project Supplemental Traffic Study

I-405 Northbound Approaching I-605

The volumes used in this analysis are not the forecast traffic demand volumes presented in the Traffic Study, because those volumes are the same for all of the alternatives and because those are demand volumes that the freeway may not be capable of fully serving in a single hour. A complete table showing the traffic volumes and all other values used in this analysis is presented in Appendix IV.

Alternatives 1 and 3 have the same number of general purpose lanes throughout the study area; consequently their data are the same and are presented in the tables below under a common heading.

For segments downstream of the segment north of the SR-22 merge, future volumes were determined by subtracting forecast exiting volumes and adding forecast entering volumes. Forecast exiting volumes to Seal Beach Boulevard, SR-22/7th Street westbound, and I-605 northbound presented in the Traffic Study were reduced by the percentage by which their upstream mainline freeway volumes used in this analysis are lower than the volumes in the Traffic Study for the same segment. This process maintains the proportional relationship between freeway traffic and exiting traffic. Entering traffic at Seal Beach Boulevard is assumed to be the forecast demand volume presented in the Traffic Study. The entering and exiting volumes used in this analysis are presented in the Appendix IV.

Volume-to-capacity (V/C) ratios were calculated for each of the northbound I-405 freeway segments shown in Table 3.2. For the calculation a capacity of 2,000 vehicles per lane per hour (vplph) was used for the segment "North of SR-22 Merge" and a capacity of 1,850 vplph was used for the segments in the Seal Beach Boulevard, SR-22/7th Street, and I-605 interchange area. The 2,000 vplph capacity used for the segment "North of SR-22 Merge" is based on the values found in the PEMS data indicating that the current capacity of this segment is nearly 2,000 vplph (nearly 12,000 summed across the existing 6 general purpose lanes). The 1,850 vplph used in the interchange areas is consistent with the capacity used in the Traffic Study and is fully explained in Appendix A1 of the Traffic Study. The V/C ratios for each segment are shown in the Appendix IV of this Supplement.

Forecast speeds were calculated using the V/C ratios based on the same process used to forecast speeds in the Traffic Study. The process is documented in Appendix A1 of the Traffic Study. The forecast volumes and speeds for each alternative are presented in Table 3.2.

Table 3.2 shows that, during the PM peak hour in year 2040, there will be minor disruption to traffic flow in the general purpose lanes under the No Build Alternative, Alternative 1, and Alternative 3. Under the No Build Alternative speeds will fall to 54 mph and to 58 mph under Alternatives 1 and 3. Under Alternative 2 more substantial disruption to traffic will occur with speeds decreased to as low as 42 mph.

During the AM peak hour in year 2040 Table 3.2 shows that there will be substantial disruption to traffic flow under all of the alternatives. Under the No Build Alternative speeds will decrease to as low as 49 mph, as low as 36 mph under Alternatives 1 and 3, and as low as 16 mph under Alternative 2. In general, the more lanes that are added by the build alternatives the greater the

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I-405 Improvement Project Supplemental Traffic Study

I-405 Northbound Approaching I-605

magnitude of the disruption to traffic flow in the Seal Beach Boulevard, SR-22/7th Street, and I-605 interchange area.

A comparison of the No Build Alternative in Table 3.2 to the existing condition in Table 3.1 appears to show that the disruption in traffic flow will improve despite increased traffic volumes on I-405 in the area of the Seal Beach Boulevard, SR-22/7th Street, and I-605 interchanges. A direct comparison of the forecast and existing condition speeds must be made with caution, because the forecast speeds are based on modeling and existing speeds are based on field observation. It is not likely that speeds will increase with growth in traffic. The largest increases in speed from the existing condition to the No Build Alternative occur on the segment north of the exit to I-605 northbound and could be partially attributable to the forecast speed model not accounting for any back up and reduced speeds due to downstream congestion where the I-605 southbound ramp merges into northbound I-405. It is also possible that the forecast speed model is slightly overstating forecast speeds on I-405, but the forecasts across the alternatives provide an accurate relative comparison.

In summary, during the PM peak hour there is not substantial disruption in traffic flow in the general purpose lanes on northbound I-405 approaching the Seal Beach Boulevard, SR-22/7th Street, I-605 interchanges, nor is any expected under the future No Build Alternative or under Alternatives 1 or 3 in year 2040. However, slowing and substantial disruption in traffic flow is anticipated during the PM peak hour under Alternative 2. During the AM peak hour substantial slowing and substantial disruption in traffic flow is anticipated during the AM peak hour under all alternatives. The magnitude of the slowing and disruption in traffic flow is least under the No Build Alternative and increases with the number of additional general purpose lanes proposed under the build alternatives.

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I-405 Improvement Project Supplemental Traffic Study

I-405 Northbound Approaching I-605

**Table 3.1 Existing 2009 Peak Hour Traffic Volumes and Speeds
Northbound on I-405 approaching the I-605/SR-22/7th Street Interchange**

Location	Number of Lanes	AM Peak Hour		PM Peak Hour	
		Volume	Speed	Volume	Speed
North of SR-22 Merge	6	11,758	59	11,896	59
At Seal Beach Boulevard	6	11,048	59	11,156	58
North of SR-22/7th St Exit	5	9,677	58	9,653	64
North of Exit to I-605 Northbound	4	6,510	49	5,822	67

Notes:

GP-General Purpose

Note: Peak hour is defined by the location North of SR-22; other locations show the volume and speed for that same hour.

Source: PEMS

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I-405 Improvement Project Supplemental Traffic Study

I-405 Northbound Approaching I-605

**Table 3.2 2040 Peak Hour Traffic Volumes and Speeds
Northbound on I-405 approaching the I-605/SR-22/7th Street Interchange**

Location	Number of Lanes	AM Peak Hour		PM Peak Hour	
		Volume	Speed	Volume	Speed
No Build Alternative					
North of SR-22 Merge	6	11,758	59	11,896	59
At Seal Beach Boulevard	6	11,048	59	11,156	58
North of SR-22/7th St Exit	5	9,677	58	9,653	64
North Exit to I-605 Northbound	4	6,510	49	5,822	67
Alternatives 1 and 3					
North of SR-22 Merge	7	13,718	61	13,879	59
At Seal Beach Boulevard	7	13,075	58	12,961	58
North of SR-22/7th St Exit	6	11,545	54	11,146	58
North Exit to I-605 Northbound	4	8,712	36	7,097	63
Alternative 2					
North of SR-22 Merge	6	15,677	61	15,861	59
At Seal Beach Boulevard	6	14,943	58	14,812	58
North of SR-22/7th St Exit	5	13,093	36	12,617	42
North Exit to I-605 Northbound	4	9,881	16	8,033	49

Notes:

Source: Parsons

GP-General Purpose

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I-405 Improvement Project Supplemental Traffic Study

Long Beach Area Traffic Study

4.0 LONG BEACH AREA TRAFFIC STUDY

4.1 Introduction

The purpose of the Long Beach Area Traffic Study is to supplement the Traffic Study with traffic information to the areas north of the limits of the proposed freeway capacity enhancements in Orange County. The objective of the Long Beach Area Traffic Study is to determine the extent of any potential traffic impacts of the proposed project alternatives north of the limits of the proposed capacity improvements.

The study area for the Long Beach Area Traffic Study includes:

- I-405 from I-605 to Lakewood Boulevard;
- I-605 from Katella Avenue to Carson Street; and
- SR-22/7th Street from I-405 to Pacific Coast Highway.

The study area includes all of the interchanges along I-405 and I-605 within the limits noted above including arterial/ramp intersections and arterial/arterial intersections in the immediate vicinity of the interchanges. Figure 4.1-1 shows the study area. The 35 intersections included in the study area are shown in Figure 4.1-2.

Traffic forecasts were prepared for each of the four alternatives under study utilizing OCTAM model. The four alternatives are fully described in the Traffic Study in Section 1.6 Project Alternatives Description. The following summaries of the four alternatives are presented for reference.

- No Build Alternative: Under the No Build Alternative, no improvements would be made to the I-405 corridor within the project limits by the proposed project. No additional lanes or interchange improvements would be provided. Compared to the existing condition, as recorded in the Notice of Preparation (NOP) (issued August 31, 2009) and the Notice of Intent (NOI) (issued September 1, 2009), the future No Build Alternative includes completion of the SR-22 West County Connectors Project, which is currently under construction.
- Alternative 1: Alternative 1 would add a single GP lane in each direction on I-405 from Euclid Street to the I-605 interchange.
- Alternative 2: Alternative 2 would add one GP lane in each direction on I-405 from Euclid Street to the I-605 interchange (as in Alternative 1), plus add a second GP lane in the northbound direction from Brookhurst Street to the SR-22/7th Street interchange and a second GP lane in the southbound direction from the Seal Beach Boulevard on-ramp to Brookhurst Street.
- Alternative 3: Alternative 3 would add one GP lane in each direction on I-405 from Euclid Street to the I-605 interchange (as in Alternatives 1 and 2), plus add a tolled

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Express Lane in each direction of I-405 from SR-73 to SR-22 East. The tolled Express Lane and the existing high occupancy vehicle (HOV) lanes would be managed jointly as a tolled Express Facility with two lanes in each direction from SR-73 to I-605. The tolled Express Facility would operate so that HOV2s would be tolled and HOV3+ would either be free or receive a discount. From SR-22 to I-605, the existing HOV lane and the second HOV lane that is being built as part of the WCC Project would become part of the tolled Express Facility.

Traffic forecasts were prepared for each freeway segment and each study intersection within the study area. The forecast years are the same as the forecast years in the Traffic Study: opening year 2020 and design year 2040. The forecast method uses the same OCTAM forecasts that were used in the Traffic Study and explained in Section 2.2.2 of the Traffic Study, except that the fourth step of the forecasting process, trip assignment, was rerun after additional roadway segments were coded into the highway network within the study area for the Long Beach Area Traffic Study. Additionally, separate traffic forecasts were used for each of the four alternatives under study.

The analytical methods used for the freeway are the same Highway Capacity Manual methods those described in the Traffic Study in Section 2.1.1 Freeway Mainline Analysis Methodology, Section 2.1.2 Ramps and Ramp-Freeway Junction Analysis Methodology, and Section 2.1.3 Weaving Analysis Methodology. The analytical methods used for the arterials in the interchange areas are the same Highway Capacity Manual (HCM) methods described in the Traffic Study in Section 3.1.1 Intersection Level of Service Analyses and Section 3.1.2 Vehicle Queuing at Freeway Off-Ramps.

For the freeways, impacts are evaluated in terms of changes in level-of-service (LOS) and volume-to-capacity (V/C) or demand-to-capacity (D/C) ratios. For arterial intersections the City of Long Beach criteria are used to evaluate potential impacts. The City of Long Beach criteria are applied using the Highway Capacity Manual operational intersection analysis methods for signalized and unsignalized intersections. A signalized intersection operating with a LOS E or F and whose D/C ratio increases by more than 0.02 under "with project" condition compared to No Build Alternative is considered exceeds the City of Long Beach criteria. An unsignalized intersection operating with LOS E or F under "with project" conditions is to be reanalyzed assuming a traffic signal to determine if the intersection exceeds the City of Long Beach criteria.

The geometric conditions and type of traffic control for years 2020 and 2040 are assumed to be unchanged from the existing conditions. There are no committed projects within the study area for the Long Beach Traffic Study. Figure 4.1-3 presents the intersection geometrics and Figure 4.1-4 presents the freeway geometrics.

4.2 Existing (Year 2009) Conditions

This section of the report provides an analysis of the study intersections and mainline freeway as well as the freeway/ramp junction locations for Existing (Year 2009) conditions. Existing (Year 2009) conditions analyses are based on year 2009 traffic volumes and current traffic control/lane

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geometrics at the study intersections and freeway segments and ramps within the project limits. The HCM methodology was used to analyze the LOS at all the analysis locations. Intersection analysis worksheets for Existing (Year 2009) condition are provided in Appendix V.A. Freeway analyses worksheets for Existing (Year 2009) condition are provided in Appendix V.B, V.C and V.D.

4.2.1 Existing (Year 2009) Traffic Volumes

Existing (Year 2009) peak hour intersection traffic volumes is presented in Figure 4.2-1 and peak hour freeway traffic volumes along the I-405 mainline, I-605 mainline and SR-22/7th Street mainline and all interchange ramps within the study area are illustrated in Figure 4.2-2.

4.2.2 Existing (2009) Intersection Traffic Analysis

A summary of level of service (LOS) for the morning (AM) and evening (PM) peak hours for existing conditions, including traffic control at study intersections, is provided in Table 4.2-1. The LOS analysis conducted for existing conditions indicates that all study currently operate at LOS D or better during the AM and PM peak hours except for the following intersections that are currently operating at LOS E or F during the AM or PM peak hours:

- Willow Street/Lakewood Boulevard (PM LOS = E and V/C = 0.92)
- Willow Street/Bellflower Boulevard (AM LOS = F and V/C = 0.84)
- Los Coyotes Diagonal/Bellflower Boulevard (PM LOS = E and V/C = 0.97)
- Willow Street/Los Coyotes Diagonal (PM LOS = F and V/C = 0.74)
- Willow Street/Woodruff Avenue (AM LOS = F and V/C = 1.07)
- Woodruff Avenue/Palo Verde (AM LOS = F and V/C = 0.87)
- SR-22 WB On/Off-Ramp/College Park Dr (PM LOS = F and V/C = 0.65)
- 7th Street/Pacific Coast Highway (AM LOS = F and V/C = 0.95; PM LOS = F and V/C = 1.03)
- 7th Street/Bellflower Boulevard (AM LOS = E and V/C = 1.01; PM LOS = F and V/C = 0.91)
- 7th Street/W. Campus Drive (AM LOS = F and V/C = 0.83)

A comparison of existing vehicle queuing (AM and PM peak hour 95th percentile queues) and available queue storage (in feet) is included in Table 4.2-2. During the peak hours, most of the turn pockets at the arterial intersections currently provide sufficient queue storage except at the following locations:

- Carson Street/Pioneer Boulevard
 - Northbound left turn lane
 - Eastbound left turn lane
- Willow Street/Bellflower Boulevard
 - Northbound left turn lane
 - Southbound left turn lane
 - Eastbound left turn lane
 - Westbound left turn lane
- Los Coyotes Diagonal/Bellflower Boulevard
 - Northbound right turn lane
 - Eastbound left turn lane

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- Westbound left turn lane
- Willow Street/Los Coyotes Diagonal
 - Eastbound left turn lane
 - Westbound left turn lane
- Willow Street/Woodruff Avenue
 - Northbound left turn lane
 - Southbound left turn lane
 - Westbound left turn lane
- Willow Street/Palo Verde
 - Eastbound right turn lane
- Stearns Street/Palo Verde
 - Northbound left turn lane
 - Southbound left turn lane
 - Eastbound left turn lane
 - Westbound left turn lane
- I-405 NB Direct On-Ramp/Studebaker Road
 - Northbound left turn lane
- Atherton Street/Studebaker Road
 - Eastbound left turn lane
- SR-22 EB On/Off-Ramp/Studebaker Road
 - Northbound right turn lane
- 7th Street/Bellflower Boulevard
 - Northbound right turn lane
 - Southbound left turn lane
 - Southbound right turn lane
 - Eastbound left turn lane
- Pacific Coast Highway/Bellflower Boulevard
 - Westbound left turn lane
- 7th Street/Channel Drive
 - Westbound left turn lane
- 7th Street/W. Campus Drive
 - Southbound left/right turn lane
- 7th Street/E. Campus Drive
 - Southbound left turn lane
 - Eastbound left turn lane

The freeway off-ramp vehicle queuing is also shown in Table 4.2-2. During the peak hours all the freeway off-ramps provide sufficient storage to accommodate the queues under Existing (Year 2009) conditions.

4.2.3 Existing (Year 2009) Freeway Traffic Analysis

Findings for the northbound and southbound freeway segments under Existing (Year 2009) conditions are summarized in Table 4.2-3. The peak hour capacity, volume, V/C ratio, density and LOS for all the freeway segments are shown.

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Under Existing (Year 2009) conditions, the northbound I-405 mainline currently operates at LOS E during the AM peak hour and LOS D during the PM peak hour. The southbound I-405 mainline currently operates at LOS D during both the AM and PM peak hours except at one segment location. The southbound I-405 segment between Woodruff Avenue and Palo Verde Avenue/Stearns Street currently operates at LOS E during the AM and PM peak hours. The northbound and southbound I-405 HOV lanes currently operate below capacity except during the AM peak hour in the northbound direction between Temple Avenue and Studebaker Road with D/C ratios ranging between 1.04 and 1.06.

Under Existing (Year 2009) conditions, the I-605 freeway mainline segments currently operate at LOS C or D during the AM and PM peak hours in both directions except for the segments between Carson Street and Spring Street. In the northbound direction, the segments between Carson Street and Spring Street are currently operating at LOS E during the PM peak hour. In the southbound direction, the segment between Carson Street and the HOV transition area is currently operating at LOS E during both the AM and PM peak hours. The northbound and southbound I-605 HOV lanes are currently operating below capacity.

Under Existing (Year 2009) conditions, the SR-22/7th Street freeway mainline segment between Pepper Tree Lane and Studebaker Road operates from LOS A to LOS D during the AM and PM peak hours in both directions, while the segment between Studebaker Road and I-605 operates from LOS D to LOS F during the AM and PM peak hours in both directions.

Ramps and Ramp-Freeway Junction Analysis and Levels of Service

The density and LOS for each of the ramps along I-405, I-605 and SR-22/7th Street within the study area for Existing (Year 2009) conditions are based on year 2009 traffic volumes. Table 4.2-4 provides a summary of the findings from the analyses for Existing (Year 2009) conditions during the AM and PM peak hours, respectively. The peak hour capacity, volume, V/C ratio, density, and LOS for each of the freeway ramps are presented.

Under Existing (Year 2009) conditions, the I-405 ramp junction peak hour LOS generally ranges from LOS B to LOS F, depending upon time of day and direction of travel. Similarly, the SR-22/7th Street ramp junction peak hour LOS generally ranges from LOS B to LOS F, depending upon time of day and direction of travel. For the I-605 ramp junction peak hour LOS generally ranges from LOS A to LOS E, depending upon time of day and direction of travel.

The freeway-to-freeway branch connectors are currently operating at under-capacity during both AM and PM peak hours except at one location. The V/C ratio for the branch connector from I-605 southbound to 7th Street/I-405 is currently 1.51 and 1.33 during the AM and PM peak hours, respectively.

Weaving Analysis

Weaving analysis was conducted between on-ramps and off-ramps spaced less than 2,500 feet apart. Separate analyses were conducted, as appropriate, for freeways and collector-distributor (C-D) roads. Weaving analyses for Existing (2009) conditions is based on year 2009 traffic volumes. Table 4.2-5 summarizes the weaving analysis findings for Existing (2009) conditions

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for both the freeway segments and the C-D roads. The density and LOS for all the weaving sections are shown.

Under Existing (Year 2009) conditions, I-405 mainline freeway weaving segments operate between LOS D and LOS F. Weaving analysis was conducted for the C-D roads at the Lakewood Boulevard/Willow Street interchange and the Bellflower Boulevard/Los Coyotes Diagonal interchange. The analysis shows that the weaving segments on the C-D roads currently operate between LOS A and C during the peak hours.

4.3 No Build Alternative Conditions

This section of the report provides an analysis of the study intersections and mainline freeway as well as the freeway/ramp junction locations for years 2020 and 2040 No Build Alternative conditions. No Build Alternative conditions analyses are based on forecasted years 2020 and 2040 No Build Alternative traffic volumes and year 2009 traffic control/lane geometrics at the study intersections and freeway segments and ramps within the project limits. As discussed in Section 4.1, geometric conditions and type of traffic control for years 2020 and 2040 are assumed to be unchanged from existing conditions (Year 2009). Intersection analysis worksheets for years 2020 and 2040 No Build Alternative conditions are provided in Appendix VLA. Freeway analyses worksheets for years 2020 and 2040 No Build Alternative conditions are provided in Appendix VLB.

4.3.1 No Build Alternative Traffic Volumes

Year 2020 No Build Alternative intersection peak hour traffic volumes are presented in Figure 4.3-1. Year 2040 No Build Alternative intersection peak hour traffic volumes are presented in Figure 4.3-2. Years 2020 and 2040 No Build peak hour traffic volumes for the I-405 mainline, I-605 mainline and SR-22/7th Street mainline and all interchange ramps within the study area are illustrated in Figures 4.3-3 and 4.3-4, respectively.

4.3.2 No Build Alternative (Year 2020) Intersection Traffic Analysis

A summary of LOS for AM and PM peak hours for year 2020 No Build Alternative conditions, including traffic control at study intersections, is provided in Table 4.3-1. The LOS analysis conducted for year 2020 No Build Alternative conditions indicates that all study intersections are anticipated to operate at LOS D or better during the AM and PM peak hours except for the following intersections that are anticipated to operate at LOS E or F during the AM or PM peak hours:

- Willow Street/Woodruff Avenue (AM LOS = F and D/C = 1.33)
- I-405 SB Direct Off-Ramp/Studebaker Rd (AM LOS = F and D/C = 0.86)
- SR-22 WB On/Off-Ramp/College Park Dr (PM LOS = F and D/C = 0.61)
- 7th Street/Bellflower Boulevard (AM LOS = E and D/C = 1.04)

A comparison of year 2020 No Build Alternative vehicle queuing (AM and PM peak hour 95th percentile queues) and available queue storage (in feet) is included in Table 4.3-2. During the peak hours, most of the turn pockets at the arterial intersections are anticipated to provide sufficient queue storage except at the following locations:

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- Carson Street/Pioneer Boulevard
 - Northbound left turn lane
 - Eastbound left turn lane
- Willow Street/Lakewood Boulevard
 - Westbound left turn lane
- Willow Street/Bellflower Boulevard
 - Northbound left turn lane
 - Southbound left turn lane
 - Eastbound left turn lane
 - Westbound left turn lane
- Los Coyotes Diagonal/Bellflower Boulevard
 - Eastbound left turn lane
 - Westbound left turn lane
- Willow Street/Los Coyotes Diagonal
 - Southbound left turn lane
 - Eastbound left turn lane
 - Westbound left turn lane
- Willow Street/Woodruff Avenue
 - Northbound left turn lane
 - Southbound left turn lane
 - Southbound right turn lane
 - Eastbound left turn lane
 - Westbound left turn lane
- Stearns Street/Palo Verde
 - Northbound left turn lane
 - Southbound left turn lane
 - Eastbound left turn lane
 - Westbound left turn lane
- Atherton Street/Studebaker Road
 - Eastbound left turn lane
- SR-22 EB On/Off-Ramp/Studebaker Road
 - Northbound right turn lane
 - Southbound left turn lane
- 7th Street/Pacific Coast Highway
 - Southbound left turn lane
- 7th Street/Bellflower Boulevard
 - Southbound left turn lane
 - Southbound right turn lane
 - Eastbound left turn lane
- Pacific Coast Highway/Bellflower Boulevard
 - Southbound left turn lane
- 7th Street/W. Campus Drive
 - Southbound left/right turn lane
- 7th Street/E. Campus Drive

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- Southbound left turn lane
- Eastbound left turn lane

The freeway off-ramp vehicle queuing is also shown in Table 4.3-2. During the peak hours, two freeway off-ramp locations are anticipated to exceed the available storage length under year 2020 No Build Alternative conditions:

- Carson Street/I-605 SB Off-Ramp
 - Southbound left turn lane
- SR-22 EB On/Off-Ramp/Studebaker Road
 - Westbound right turn lane

4.3.3 No Build Alternative (Year 2040) Intersection Traffic Analysis

A summary of LOS for AM and PM peak hours for year 2040 No Build Alternative conditions, including traffic control at study intersections, is provided in Table 4.3-3. The LOS analysis conducted for year 2040 No Build Alternative conditions indicates that all study intersections are anticipated to operate at LOS D or better during the AM and PM peak hours except for the following intersections that are anticipated to operate at LOS E or F during the AM or PM peak hours:

- Willow Street/Bellflower Boulevard (AM LOS = E and D/C = 1.09; PM LOS = E, D/C = 1.09)
- Los Coyotes Diagonal/Bellflower Boulevard (PM LOS = E and D/C = 1.13)
- Willow Street/Woodruff Avenue (AM LOS = F and D/C = 1.44)
- I-405 SB Direct Off-Ramp/Studebaker Rd (AM LOS = F and D/C = 1.02)
- SR-22 WB On/Off-Ramp/College Park Dr (PM LOS = F and D/C = 0.84)
- 7th Street/Pacific Coast Highway (AM LOS = E and D/C = 1.02; PM LOS = E, D/C = 1.03)
- 7th Street/Bellflower Boulevard (AM LOS = F and D/C = 1.13; PM LOS = E and D/C = 1.06)
- 7th Street/W. Campus Drive (PM LOS = E and D/C = 0.87)
- 7th Street/E. Campus Drive (AM LOS = E and D/C = 1.12)

A comparison of year 2040 No Build Alternative vehicle queuing (AM and PM peak hour 95th percentile queues) and available queue storage (in feet) is included in Table 4.3-4. During the peak hours, most of the turn pockets at the arterial intersections are anticipated to provide sufficient queue storage except at the following locations:

- Carson Street/Pioneer Boulevard
 - Northbound left turn lane
 - Eastbound left turn lane
- Spring Street/Cerritos Ave/I-605 NB On-Ramp
 - Westbound left turn lane
- Willow Street/Lakewood Boulevard
 - Westbound left turn lane
- Willow Street/Bellflower Boulevard
 - Northbound left turn lane
 - Southbound left turn lane

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- Eastbound left turn lane
- Westbound left turn lane
- Los Coyotes Diagonal/Bellflower Boulevard
 - Eastbound left turn lane
 - Westbound left turn lane
- Willow Street/Los Coyotes Diagonal
 - Southbound left turn lane
 - Westbound left turn lane
 - Eastbound left turn lane
- Willow Street/Woodruff Avenue
 - Northbound left turn lane
 - Southbound left turn lane
 - Southbound right turn lane
 - Eastbound left turn lane
 - Westbound left turn lane
- Woodruff Ave/Palo Verde
 - Eastbound left turn lane
- Stearns Street/Palo Verde
 - Northbound left turn lane
 - Southbound left turn lane
 - Eastbound left turn lane
 - Westbound left turn lane
- Atherton Street/Studebaker Road
 - Eastbound left turn lane
- SR-22 EB On/Off-Ramp/Studebaker Road
 - Northbound right turn lane
 - Southbound left turn lane
- 7th Street/Pacific Coast Highway
 - Southbound left turn lane
- 7th Street/Bellflower Boulevard
 - Northbound right turn lane
 - Southbound left turn lane
 - Southbound right turn lane
 - Eastbound left turn lane
- Pacific Coast Highway/Bellflower Boulevard
 - Southbound left turn lane
 - Eastbound left turn lane
- 7th Street/W. Campus Drive
 - Southbound left/right turn lane
- 7th Street/E. Campus Drive
 - Southbound left turn lane
 - Eastbound left turn lane

The freeway off-ramp vehicle queuing is also shown in Table 4.3-4. During the peak hours, two freeway off-ramp locations are anticipated to exceed the available storage length under year 2040 No Build Alternative conditions:

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- Carson Street/I-605 SB Off-Ramp
 - Southbound left turn lane
- SR-22 EB On/Off-Ramp/Studebaker Road
 - Westbound right turn lane

4.3.4 No Build Alternative (Year 2020) Freeway Traffic Analysis

Findings for the northbound and southbound freeway segments under No Build Alternative conditions for year 2020 are summarized in Table 4.3-5. The peak hour capacity, demand volume, D/C ratio, density and LOS for all the freeway segments are shown.

Under No Build Alternative conditions for year 2020, the I-405 freeway mainline segments are projected to operate at either LOS E or F during the AM and PM peak hours in both directions with few exceptions. The exceptions include the I-405 southbound segment between Studebaker Road to I-605 southbound ramp which is projected to operate at LOS D during the PM peak hour. Majority of the northbound and southbound I-405 HOV lanes are anticipated to operate at over-capacity during the AM or PM peak hours under year 2020 No Build Alternative conditions with D/C ratios ranging from 1.01 to 1.51.

Under No Build Alternative conditions for year 2020, the I-605 freeway mainline segments are projected to operate between LOS B and LOS D during the AM and PM peak hours in both directions except for the segment between Carson Street and Spring Street, which southbound movement is anticipated to operate at LOS E during the AM peak hour and the northbound movement is anticipated to operate at LOS E during the PM peak hour.

Under No Build Alternative conditions for year 2020, the SR-22/7th Street freeway mainline segment between Pepper Tree Lane and Studebaker Road, is anticipated to operate at LOS B or LOS C during the AM and PM peak hours in both directions, while the segment between Studebaker Road and I-605, is anticipated to operate from LOS E to LOS F during the AM and PM peak hours in both directions.

Ramps and Ramp-Freeway Junction Analysis and Levels of Service

The density and LOS for each of the ramps along I-405, I-605 and SR-22/7th Street within the study area for No Build Alternative are based on projected year 2020 traffic volumes. Table 4.3-6 provide a summary of the findings from the analysis for year 2020 No Build Alternative conditions during the AM and PM peak hours. The peak hour capacity, demand volume, D/C ratio, density, and LOS for each of the freeway ramps are presented.

Under No Build Alternative conditions for year 2020, the projected LOS for the I-405 ramp junctions generally ranges from LOS B to LOS F, depending upon time of day and direction of travel. For the I-605 ramp junctions, the peak hour LOS generally ranges from LOS A to LOS E, depending upon time of day and direction of travel. The peak hour LOS expected for the SR-22/7th Street ramp junctions, generally ranges from LOS C to LOS F, depending upon time of day and direction of travel.

The freeway-to-freeway branch connectors are anticipated to operate at under-capacity during both AM and PM peak hours except at two locations. The D/C ratio for the branch connector

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from I-605 southbound to 7th Street/I-405 is anticipated to be 1.32 and 1.12 during the AM and PM peak hours, respectively. The branch connector from I-605 southbound/I-405 southbound to 7th Street is expected to have a D/C ratio of 1.13 during the AM peak hour.

Weaving Analysis

Weaving analysis was conducted between on-ramps and off-ramps spaced less than 2,500 feet apart. Separate analyses were conducted, as appropriate, for freeways and C-D roads. Weaving analyses for No Build Alternative are based on projected year 2020 traffic volumes. Table 4.3-7 summarizes the weaving analysis findings for year 2020 conditions for No Build Alternative for both the freeway segments and the C-D roads. The density and LOS for all the weaving sections are shown.

Under year 2020 No Build Alternative condition, the I-405 freeway weaving segments are anticipated to operate at LOS E or LOS F during the peak hours except at one location during the AM peak hour. The I-405 southbound freeway weaving segment between Palo Verde Avenue/Stearns Street and Studebaker Road is expected to operate at LOS D during the AM peak hour. Weaving analysis was conducted for the C-D roads at the Lakewood Boulevard/Willow Street interchange and the Bellflower Boulevard/Los Coyotes Diagonal interchange. The analysis shows that the weaving segments on the C-D roads are anticipated to operate between LOS A and C during the peak hours.

4.3.5 No Build Alternative (Year 2040) Freeway Traffic Analysis

Findings for the northbound and southbound freeway segments under No Build Alternative conditions for year 2040 are summarized in Table 4.3-8. The peak hour capacity, demand volume, D/C ratio, density and LOS for all the freeway segments are shown.

Under No Build Alternative conditions for year 2040, the I-405 freeway mainline segments are projected to operate at either LOS E or F during the AM and PM peak hours in both directions with few exceptions. The exceptions include the I-405 southbound segment between Studebaker Road to I-605 southbound ramp which is projected to operate at LOS D during the AM peak hour. The northbound and southbound I-405 HOV lanes within the project limits are anticipated to operate at over-capacity during the AM or PM peak hours under year 2040 No Build Alternative conditions with D/C ratios ranging from 1.01 to 1.63.

Under No Build Alternative conditions for year 2040, the I-605 freeway mainline segments are anticipated to operate between LOS C and LOS D during the AM and PM peak hours in both directions except for the freeway segment between Carson Street and Spring Street. The northbound I-605 freeway segment between Carson Street and Spring Street is anticipated to operate at LOS E during the PM peak hour. The southbound I-605 freeway segment between Carson Street and Spring Street is anticipated to operate at LOS F and E during the AM and PM peak hours, respectively.

Under No Build Alternative conditions for year 2040, the SR-22/7th Street freeway mainline segment between Pepper Tree Lane and Studebaker Road, is anticipated to operate at LOS B or LOS C during the AM and PM peak hours in both directions, while the segment between Studebaker Road and I-605, is anticipated to operate between LOS E to LOS F during the AM and PM peak hours in both directions.

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Ramps and Ramp-Freeway Junction Analysis and Levels of Service

The density and LOS for each of the ramps along I-405, I-605 and SR-22/7th Street within the study area for No Build Alternative are based on projected year 2040 traffic volumes. Table 4.3-9 provide a summary of the findings from the analysis for year 2040 No Build Alternative conditions during the AM and PM peak hours. The peak hour capacity, demand volume, D/C ratio, density, and LOS for each of the freeway ramps are presented.

Under No Build Alternative conditions for year 2040, the projected LOS for the I-405 ramp junctions generally ranges from LOS B to LOS F, depending upon time of day and direction of travel. For the I-605 ramp junctions, the peak hour LOS generally ranges from LOS A to LOS F, depending upon time of day and direction of travel. The peak hour LOS expected for the SR-22/7th Street ramp junctions, generally ranges from LOS C to LOS F, depending upon time of day and direction of travel.

The freeway-to-freeway branch connectors are anticipated to operate at under-capacity during both AM and PM peak hours except at two locations. The D/C ratio for the branch connector from I-605 southbound to 7th Street/I-405 is anticipated to be 1.43 and 1.21 during the AM and PM peak hours, respectively. The branch connector from I-605 southbound/I-405 southbound to 7th Street is expected to have a D/C ratio of 1.22 during the AM peak hour.

Weaving Analysis

Weaving analysis was conducted between on-ramps and off-ramps spaced less than 2,500 feet apart. Separate analyses were conducted, as appropriate, for freeways and C-D roads. Weaving analyses for No Build Alternative are based on projected year 2040 traffic volumes. Table 4.3-10 summarizes the weaving analysis findings for year 2040 conditions for No Build Alternative for both the freeway segments and the C-D roads.

For year 2040 conditions, the mainline freeway weaving segments are projected to operate at LOS E to LOS F during the peak hours. Weaving analysis was conducted for the C-D roads at the Lakewood Boulevard/Willow Street interchange and the Bellflower Boulevard/Los Coyotes Diagonal interchange. The analysis shows that the weaving segments on the C-D roads are anticipated to operate between LOS A and C during the peak hours.

4.4 Alternative 1 Conditions

This section of the report provides an analysis of the study intersections and mainline freeway as well as the freeway/ramp junction locations for years 2020 and 2040 Alternative 1 conditions. Alternative 1 condition analyses are based on forecasted years 2020 and 2040 Alternative 1 traffic volumes and year 2009 traffic control/lane geometries at the study intersections and freeway segments and ramps within the project limits. As discussed in Section 4.1, geometric conditions and type of traffic control for years 2020 and 2040 are assumed to be unchanged from existing conditions (Year 2009). Intersection analysis worksheets for years 2020 and 2040 Alternative 1 conditions are provided in Appendix VII.A. Freeway analyses worksheets for years 2020 and 2040 Alternative 1 conditions are provided in Appendix VII.B.

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4.4.1 Alternative 1 Traffic Volumes

Year 2020 Alternative 1 intersection peak hour traffic volumes are presented in Figure 4.4-1. Year 2040 Alternative 1 intersection peak hour traffic volumes are presented in Figure 4.4-2. Years 2020 and 2040 Alternative 1 peak hour traffic volumes for the I-405 mainline, I-605 mainline and SR-22/7th Street mainline and all interchange ramps within the study area are illustrated in Figures 4.4-3 and 4.4-4, respectively.

4.4.2 Alternative 1 (Year 2020) Intersection Traffic Analysis

A summary of LOS for AM and PM peak hours for year 2020 Alternative 1 conditions, including traffic control at study intersections, is provided in Table 4.4-1. The LOS analysis conducted for year 2020 Alternative 1 conditions indicates that all study intersections are anticipated to operate at LOS D or better during the AM and PM peak hours except for the following intersections that are anticipated to operate at LOS E or F during the AM or PM peak hours:

- Willow Street/Woodruff Avenue (AM LOS = F and D/C = 1.32)
- I-405 SB Direct Off-Ramp/Studebaker Rd (AM LOS = F and D/C = 1.03)
- SR-22 WB On/Off-Ramp/College Park Dr (PM LOS = F and D/C = 0.73)
- 7th Street/Bellflower Boulevard (AM LOS = E and D/C = 1.06)

A comparison of year 2020 Alternative 1 vehicle queuing (AM and PM peak hour 95th percentile queues) and available queue storage (in feet) is included in Table 4.4-2. During the peak hours, most of the turn pockets at the arterial intersections are anticipated to provide sufficient queue storage except at the following locations:

- Carson Street/Pioneer Boulevard
 - Northbound left turn lane
 - Eastbound left turn lane
- Willow Street/Bellflower Boulevard
 - Northbound left turn lane
 - Southbound left turn lane
 - Eastbound left turn lane
 - Westbound left turn lane
- Los Coyotes Diagonal/Bellflower Boulevard
 - Eastbound left turn lane
 - Westbound left turn lane
- Willow Street/Los Coyotes Diagonal
 - Southbound left turn lane
 - Eastbound left turn lane
 - Westbound left turn lane
- Willow Street/Woodruff Avenue
 - Northbound left turn lane
 - Southbound left turn lane
 - Southbound right turn lane
 - Eastbound left turn lane
 - Westbound left turn lane

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- Stearns Street/Palo Verde
 - Northbound left turn lane
 - Southbound left turn lane
 - Eastbound left turn lane
 - Westbound left turn lane
- Atherton Street/Studebaker Road
 - Eastbound left turn lane
- SR-22 EB On/Off-Ramp/Studebaker Road
 - Northbound right turn lane
 - Southbound left turn lane
- 7th Street/Pacific Coast Highway
 - Southbound left turn lane
- 7th Street/Bellflower Boulevard
 - Southbound left turn lane
 - Southbound right turn lane
 - Eastbound left turn lane
- 7th Street/W. Campus Drive
 - Southbound left/right turn lane
- 7th Street/E. Campus Drive
 - Southbound left turn lane
 - Eastbound left turn lane

The freeway off-ramp vehicle queuing is also shown in Table 4.4-2. During the peak hours, two freeway off-ramp locations are anticipated to exceed the available storage length under year 2020 Alternative 1 conditions:

- Carson Street/I-605 SB Off-Ramp
 - Southbound left turn lane
- SR-22 EB On/Off-Ramp/Studebaker Road
 - Westbound right turn lane

4.4.3 Alternative 1 (Year 2040) Intersection Traffic Analysis

A summary of LOS for AM and PM peak hours for year 2040 Alternative 1 conditions, including traffic control at study intersections, is provided in Table 4.4-3. The LOS analysis conducted for year 2040 Alternative 1 conditions indicates that all study intersections are anticipated to operate at LOS D or better during the AM and PM peak hours except for the following intersections that are anticipated to operate at LOS E or F during the AM or PM peak hours:

- Willow Street/Bellflower Boulevard (AM LOS = E and D/C = 1.09; PM LOS = E, D/C = 1.10)
- Los Coyotes Diagonal/Bellflower Boulevard (PM LOS = E and D/C = 1.15)
- Willow Street/Woodruff Avenue (AM LOS = F and D/C = 1.43)
- I-405 SB Direct Off-Ramp/Studebaker Rd (AM LOS = F and D/C = 1.24)
- SR-22 WB On/Off-Ramp/College Park Dr (PM LOS = F and D/C = 1.00)
- 7th Street/Pacific Coast Highway (AM LOS = E and D/C = 1.04; PM LOS = E, D/C = 1.04)

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- 7th Street/Bellflower Boulevard (AM LOS = F and D/C = 1.14; PM LOS = E and D/C = 1.04)
- 7th Street/W. Campus Drive (AM LOS = E and D/C = 0.86; PM LOS = E, D/C = 0.89)
- 7th Street/E. Campus Drive (AM LOS = E and D/C = 1.13)

A comparison of year 2040 Alternative 1 vehicle queuing (AM and PM peak hour 95th percentile queues) and available queue storage (in feet) is included in **Table 4.4-4**. During the peak hours, most of the turn pockets at the arterial intersections are anticipated to provide sufficient queue storage except at the following locations:

- Carson Street/Pioneer Boulevard
 - Northbound left turn lane
 - Eastbound left turn lane
- Willow Street/Lakewood Boulevard
 - Westbound left turn lane
- Willow Street/Bellflower Boulevard
 - Northbound left turn lane
 - Southbound left turn lane
 - Eastbound left turn lane
 - Westbound left turn lane
- Los Coyotes Diagonal/Bellflower Boulevard
 - Eastbound left turn lane
 - Westbound left turn lane
- Willow Street/Los Coyotes Diagonal
 - Southbound left turn lane
 - Eastbound left turn lane
 - Westbound left turn lane
- Willow Street/Woodruff Avenue
 - Northbound left turn lane
 - Southbound left turn lane
 - Southbound right turn lane
 - Eastbound left turn lane
 - Westbound left turn lane
- Woodruff Avenue/Palo Verde
 - Eastbound left turn lane
- Stearns Street/Palo Verde
 - Northbound left turn lane
 - Southbound left turn lane
 - Eastbound left turn lane
 - Westbound left turn lane
- Atherton Street/Studebaker Road
 - Southbound right turn lane
 - Eastbound left turn lane
- SR-22 EB On/Off-Ramp/Studebaker Road
 - Northbound right turn lane
 - Southbound left turn lane

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- 7th Street/Pacific Coast Highway
 - Southbound left turn lane
- 7th Street/Bellflower Boulevard
 - Southbound left turn lane
 - Southbound right turn lane
 - Eastbound left turn lane
- Pacific Coast Highway/Bellflower Boulevard
 - Southbound left turn lane
 - Eastbound left turn lane
- 7th Street/W. Campus Drive
 - Southbound left/right turn lane
- 7th Street/E. Campus Drive
 - Southbound left turn lane
 - Eastbound left turn lane

The freeway off-ramp vehicle queuing is also shown in **Table 4.4-4**. During the peak hours, two freeway off-ramp locations are anticipated to exceed the available storage length under year 2040 Alternative 1 conditions:

- Carson Street/I-605 SB Off-Ramp
 - Southbound left turn lane
- SR-22 EB On/Off-Ramp/Studebaker Road
 - Westbound right turn lane

4.4.4 Alternative 1 (Year 2020) Freeway Traffic Analysis

Findings for the northbound and southbound freeway segments under Alternative 1 conditions for year 2020 are summarized in **Table 4.4-5**. The peak hour capacity, demand volume, D/C ratio, density and LOS for all the freeway segments are shown.

Under Alternative 1 conditions for year 2020, the I-405 freeway mainline segments are projected to operate at either LOS E or F during the AM and PM peak hours in both directions with few exceptions. The exceptions include the I-405 southbound segments between Studebaker Road to I-605 southbound ramp which is projected to operate at LOS D during the AM peak hour. Majority of the northbound and southbound I-405 HOV lanes are anticipated to operate at over-capacity during the AM or PM peak hours under year 2020 No Build Alternative conditions with D/C ratios ranging from 1.07 to 1.30.

Under Alternative 1 conditions for year 2020, the I-605 freeway mainline segments are projected to operate between LOS B and LOS D during the AM and PM peak hours in both directions except for the segment between Carson Street and Spring Street, which southbound movement is anticipated to operate at LOS E during both peak hours and the northbound movement is anticipated to operate at LOS E during the PM peak hour.

Under No Build Alternative conditions for year 2020, the SR-22/7th Street freeway mainline segment between Pepper Tree Lane and Studebaker Road, is anticipated to operate at LOS B or

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LOS C during the AM and PM peak hours in both directions, while the segment between Studebaker Road and I-605 is anticipated to operate from LOS D to LOS F during the AM and PM peak hours in both directions.

Ramps and Ramp-Freeway Junction Analysis and Levels of Service

The density and LOS for each of the ramps along I-405, I-605 and SR-227th Street within the study area for No Build Alternative are based on projected year 2020 traffic volumes. Table 4.4-6 provide a summary of the findings from the analyses for year 2020 Alternative 1 conditions during the AM and PM peak hours. The peak hour capacity, demand volume, D/C ratio, density, and LOS for each of the freeway ramps are presented.

Under Alternative 1 conditions for year 2020, the projected LOS for the I-405 ramp junctions generally ranges from LOS B to LOS F, depending upon time of day and direction of travel. For the I-605 ramp junctions, the peak hour LOS generally ranges from LOS A to LOS E, depending upon time of day and direction of travel. The peak hour LOS expected for the SR-227th Street ramp junctions, generally ranges from LOS C to LOS F, depending upon time of day and direction of travel.

The freeway-to-freeway branch connectors are anticipated to operate at under-capacity during both AM and PM peak hours except at two locations. The D/C ratio for the branch connector from I-605 southbound to 7th Street/I-405 is anticipated to be 1.38 and 1.18 during the AM and PM peak hours, respectively. The branch connector from I-605 southbound/I-405 southbound to 7th Street is expected to have a D/C ratio of 1.19 during the AM peak hour.

Weaving Analysis

Weaving analysis was conducted between on-ramps and off-ramps spaced less than 2,500 feet apart. Separate analyses were conducted, as appropriate, for freeways and C-D roads. Weaving analysis for Alternative 1 is based on projected year 2020 traffic volumes. Table 4.4-7 summarizes the weaving analysis findings for year 2020 conditions for Alternative 1 for both the freeway segments and the C-D roads. The density and LOS for all the weaving sections are shown.

Under year 2020 Alternative 1 condition, the I-405 freeway weaving segments are anticipated to operate at LOS E or LOS F during the peak hours except at one location during the AM peak hour. The I-405 southbound freeway weaving segment between Palo Verde Avenue/Stearns Street and Studebaker Road is expected to operate at LOS D during the AM peak hour. Weaving analysis was conducted for the C-D roads at the Lakewood Boulevard/Willow Street interchange and the Bellflower Boulevard/Los Coyotes Diagonal interchange. The analysis shows that the weaving segments on the C-D roads are anticipated to operate between LOS A and C during the peak hours.

4.4.5 Alternative 1 (Year 2040) Freeway Traffic Analysis

Findings for the northbound and southbound freeway segments under Alternative 1 conditions for year 2040 are summarized in Table 4.4-8. The peak hour capacity, demand volume, D/C ratio, density and LOS for all the freeway segments are shown.

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Under Alternative 1 conditions for year 2040, the I-405 freeway mainline segments are projected to operate at either LOS E or F during the AM and PM peak hours in both directions. The northbound and southbound I-405 HOV lanes within the project limits are anticipated to operate at over-capacity during the AM or PM peak hours under year 2020 Alternative 1 conditions with D/C ratios ranging from 1.16 to 1.41.

Under Alternative 1 conditions for year 2040, the I-605 freeway mainline segments are anticipated to operate between LOS C and LOS D during the AM and PM peak hours in both directions except for the freeway segment between Carson Street and Spring Street. The northbound I-605 freeway segment between Carson Street and Spring Street is anticipated to operate at LOS F during the PM peak hour. The southbound I-605 freeway segment between Carson Street and Spring Street is anticipated to operate at LOS F and E during the AM and PM peak hours, respectively.

Under Alternative 1 conditions for year 2040, the SR-227th Street freeway mainline segment between Pepper Tree Lane and Studebaker Road, is anticipated to operate at LOS B or LOS C during the AM and PM peak hours in both directions, while the segment between Studebaker Road and I-605, is anticipated to operate between LOS D to LOS F during the AM and PM peak hours in both directions.

Ramps and Ramp-Freeway Junction Analysis and Levels of Service

The density and LOS for each of the ramps along I-405, I-605 and SR-227th Street within the study area for Alternative 1 are based on projected Alternative 1 year 2040 traffic volumes. Table 4.4-9 provide a summary of the findings from the analysis for year 2040 Alternative 1 conditions during the AM and PM peak hours. The peak hour capacity, demand volume, D/C ratio, density, and LOS for each of the freeway ramps are presented.

Under Alternative 1 conditions for year 2040, the projected LOS for the I-405 ramp junctions generally ranges from LOS B to LOS F, depending upon time of day and direction of travel. For the I-605 ramp junctions, the peak hour LOS generally ranges from LOS A to LOS F, depending upon time of day and direction of travel. The peak hour LOS expected for the SR-227th Street ramp junctions, generally ranges from LOS C to LOS F, depending upon time of day and direction of travel.

The freeway-to-freeway branch connectors are anticipated to operate at under-capacity during both AM and PM peak hours except at two locations. The D/C ratio for the branch connector from I-605 southbound to 7th Street/I-405 is anticipated to be 1.49 and 1.27 during the AM and PM peak hours, respectively. The branch connector from I-605 southbound/I-405 southbound to 7th Street is expected to have a D/C ratio of 1.19 during the AM peak hour.

Weaving Analysis

Weaving analysis was conducted between on-ramps and off-ramps spaced less than 2,500 feet apart. Separate analyses were conducted, as appropriate, for freeways and C-D roads. Weaving analysis for Alternative 1 are based on projected year 2040 traffic volumes. Table 4.4-10 summarizes the weaving analysis findings for year 2040 conditions for Alternative 1 for both the freeway segments and the C-D roads.

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For year 2040 Alternative 1 conditions, the mainline freeway weaving segments are projected to operate at LOS E or LOS F during the peak hours. Weaving analysis was conducted for the C-D roads at the Lakewood Boulevard/Willow Street interchange and the Bellflower Boulevard/Los Coyotes Diagonal interchange. The analysis shows that the weaving segments on the C-D roads are anticipated to operate between LOS A and C during the peak hours.

4.4.6 Alternative 1 vs. No Build Alternative Comparison and Proposed Roadway Improvements

Intersection

Table 4.4-12 presents a comparison of Year 2040 No Build Alternative and Year 2040 Alternative 1 operating conditions anticipated for the study intersections. As shown in the table, the SR-22 westbound On/Off Ramp and College Park Drive intersection is projected to operate with LOS F during the PM peak hour under the No-Build Alternative with a Demand to Capacity (D/C) ratio of 1.16. This intersection under Alternative 1 is projected to have an increase in the D/C ratio of 0.03 for a total operating D/C ratio of 1.19 during the PM peak hour.

Based on the comparison above, the following roadway improvements could be considered to improve the intersection year 2040 operating condition as well as improve safety:

- Widen SR-22 westbound On/Off Ramp from one lane to two lanes approximately 200 feet east of the intersection extending to Studebaker Road as shown on **Figure 4.4-5**. This proposed roadway improvement could be accommodated within existing right-of-way; and
- Provide a traffic signal to control traffic movements instead of existing one-way stop control placed at the westbound College Park Drive.

Table 4.4-11 presents a comparison of Year 2020 No Build Alternative and Year 2020 Alternative 1 operating conditions anticipated for the study intersections. As shown in the table, the above roadway improvements are necessary by year 2020 to improve the intersection operating condition, which is projected to have a D/C ratio of 1.07 and LOS F under the No-Build Alternative and D/C ratio of 1.10 and LOS F under Alternative 1.

Table 4.4-12 shows intersections LOS and D/C ratio during AM and PM peak hours for Year 2040 Alternative 1 with the recommended roadway improvements.

Freeway Mainline

Table 4.4-13 presents a comparison of year 2020 No Build Alternative and year 2020 Alternative 1 operating conditions anticipated for the mainline freeway segments. The table shows that there is an increase in the D/C ratio from the No Build Alternative to Alternative 1 in many segments, with the range of increase in the GP lanes from 0.01 to 0.18 during peak hours. Higher levels of increase are generally found closer to the limits of the project improvements and diminish with increasing distance from those limits. There are several segments in which there is a decrease in the D/C ratio, shown in red on **Table 4.4-13**. Those segments that are anticipated to have a change in LOS are identified in the Evaluation column in the table.

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Table 4.4-14 presents a comparison of year 2040 No Build Alternative and year 2040 Alternative 1 operating conditions anticipated for the mainline freeway segments. The table shows that there is an increase in the D/C ratio from the No Build Alternative to Alternative 1 in many segments, with the range of increase in the GP lanes from 0.01 to 0.31 during peak hours. Higher levels of increase are generally found closer to the limits of the project improvements and diminish with increasing distance from those limits. There are several segments in which there is a decrease in the D/C ratio, shown in red on **Table 4.4-14**. Those segments that are anticipated to have a change in LOS are identified in the Evaluation column in the table.

4.5 Alternative 2 Conditions

This section of the report provides an analysis of the study intersections and mainline freeway as well as the freeway/ramp junction locations for years 2020 and 2040 Alternative 2 conditions. Alternative 2 condition analyses are based on forecasted years 2020 and 2040 Alternative 2 traffic volumes and year 2009 traffic control/lane geometrics at the study intersections and freeway segments and ramps within the project limits. As discussed in Section 4.1, geometric conditions and type of traffic control for years 2020 and 2040 are assumed to be unchanged from existing conditions (Year 2009). Intersection analysis worksheets for years 2020 and 2040 Alternative 2 conditions are provided in **Appendix VIII.A**. Freeway analyses worksheets for years 2020 and 2040 Alternative 2 conditions are provided in **Appendix VIII.B**.

4.5.1 Alternative 2 Traffic Volumes

Year 2020 Alternative 2 intersection peak hour traffic volumes are presented in **Figure 4.5-1**. Year 2040 Alternative 2 intersection peak hour traffic volumes are presented in **Figure 4.5-2**. Years 2020 and 2040 Alternative 2 peak hour traffic volumes for the I-405 mainline, I-605 mainline and SR-22/7th Street mainline and all interchange ramps within the study area are illustrated in **Figures 4.5-3** and **4.5-4**, respectively.

4.5.2 Alternative 2 (Year 2020) Intersection Traffic Analysis

A summary of LOS for AM and PM peak hours for year 2020 Alternative 2 conditions, including traffic control at study intersections, is provided in **Table 4.5-1**. The LOS analysis conducted for year 2020 Alternative 2 conditions indicates that all study intersections are anticipated to operate at LOS D or better during the AM and PM peak hours except for the following intersections that are anticipated to operating at LOS E or F during the AM or PM peak hours:

- Willow Street/Bellflower Boulevard (PM LOS = E and D/C = 1.16)
- Willow Street/Los Coyotes Diagonal (PM LOS = E and D/C = 1.25)
- Willow Street/Woodruff Avenue (AM LOS = F and D/C = 1.41)
- I-405 SB Direct Off-Ramp/Studebaker Rd (AM LOS = F and D/C = 0.90)
- SR-22 WB On/Off-Ramp/College Park Dr (PM LOS = F and D/C = 1.14)
- 7th Street/Bellflower Boulevard (AM LOS = E and D/C = 1.09)

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A comparison of year 2020 Alternative 2 vehicle queuing (AM and PM peak hour 95th percentile queues) and available queue storage (in feet) is included in Table 4.5-2. During the peak hours, most of the turn pockets at the arterial intersections are anticipated to provide sufficient queue storage except at the following locations:

- Carson Street/Pioneer Boulevard
 - Northbound left turn lane
 - Eastbound left turn lane
- Willow Street/Bellflower Boulevard
 - Northbound left turn lane
 - Southbound left turn lane
 - Eastbound left turn lane
 - Westbound left turn lane
- Los Coyotes Diagonal/Bellflower Boulevard
 - Eastbound left turn lane
 - Westbound left turn lane
- Willow Street/Los Coyotes Diagonal
 - Southbound left turn lane
 - Eastbound left turn lane
 - Westbound left turn lane
- Willow Street/Woodruff Avenue
 - Northbound left turn lane
 - Southbound right turn lane
 - Eastbound left turn lane
 - Westbound left turn lane
- Stearns Street/Palo Verde
 - Northbound left turn lane
 - Eastbound left turn lane
 - Westbound left turn lane
- Atherton Street/Studebaker Road
 - Eastbound left turn lane
- SR-22 WB On/Off-Ramp/Studebaker Road
 - Southbound left turn lane
- SR-22 EB On/Off-Ramp/Studebaker Road
 - Northbound right turn lane
 - Southbound left turn lane
- 7th Street/Pacific Coast Highway
 - Southbound left turn lane
- 7th Street/Bellflower Boulevard
 - Southbound left turn lane
 - Southbound right turn lane
 - Eastbound left turn lane
- Pacific Coast Highway/Bellflower Boulevard
 - Eastbound left turn lane
- 7th Street/W. Campus Drive

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- Southbound left/right turn lane
- 7th Street/E. Campus Drive
 - Southbound left turn lane
 - Eastbound left turn lane

The freeway off-ramp vehicle queuing is also shown in Table 4.5-2. During the peak hours, two freeway off-ramp locations are anticipated to exceed the available storage length under year 2020 Alternative 2 conditions:

- Carson Street/I-605 SB Off-Ramp
 - Southbound left turn lane
- SR-22 EB On/Off-Ramp/Studebaker Road
 - Westbound right turn lane

4.5.3 Alternative 2 (Year 2040) Intersection Traffic Analysis

A summary of LOS for AM and PM peak hours for year 2040 Alternative 2 conditions, including traffic control at study intersections, is provided in Table 4.5-3. The LOS analysis conducted for year 2040 Alternative 2 conditions indicates that all study intersections are anticipated to operate at LOS D or better during the AM and PM peak hours except for the following intersections that are anticipated to operate at LOS E or F during the AM or PM peak hours:

- Willow Street/Bellflower Boulevard (PM LOS = E, D/C = 1.25)
- Willow Street/Los Coyotes Diagonal (AM LOS = E and D/C = 0.99; PM LOS = F and D/C = 1.41)
- Willow Street/Woodruff Avenue (AM LOS = F and D/C = 1.53; PM LOS = F, D/C = 0.95)
- I-405 SB Direct Off-Ramp/Studebaker Rd (AM LOS = F and D/C = 1.04)
- SR-22 WB On/Off-Ramp/College Park Dr
(AM LOS = E and D/C = 0.75; PM LOS = F and D/C = 1.59)
- 7th Street/Pacific Coast Highway (AM LOS = E and D/C = 1.04; PM LOS = E, D/C = 1.07)
- 7th Street/Bellflower Boulevard (AM LOS = F and D/C = 1.18; PM LOS = E and D/C = 1.06)
- 7th Street/W. Campus Drive (AM LOS = E and D/C = 0.89; PM LOS = E, D/C = 0.90)
- 7th Street/E. Campus Drive (AM LOS = E and D/C = 1.17)

A comparison of year 2040 Alternative 2 vehicle queuing (AM and PM peak hour 95th percentile queues) and available queue storage (in feet) is included in Table 4.5-4. During the peak hours, most of the turn pockets at the arterial intersections are anticipated to provide sufficient queue storage except at the following locations:

- Carson Street/Pioneer Boulevard
 - Northbound left turn lane
 - Eastbound left turn lane
- Willow Street/Lakewood Boulevard
 - Westbound left turn lane
- Willow Street/Bellflower Boulevard
 - Northbound left turn lane

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